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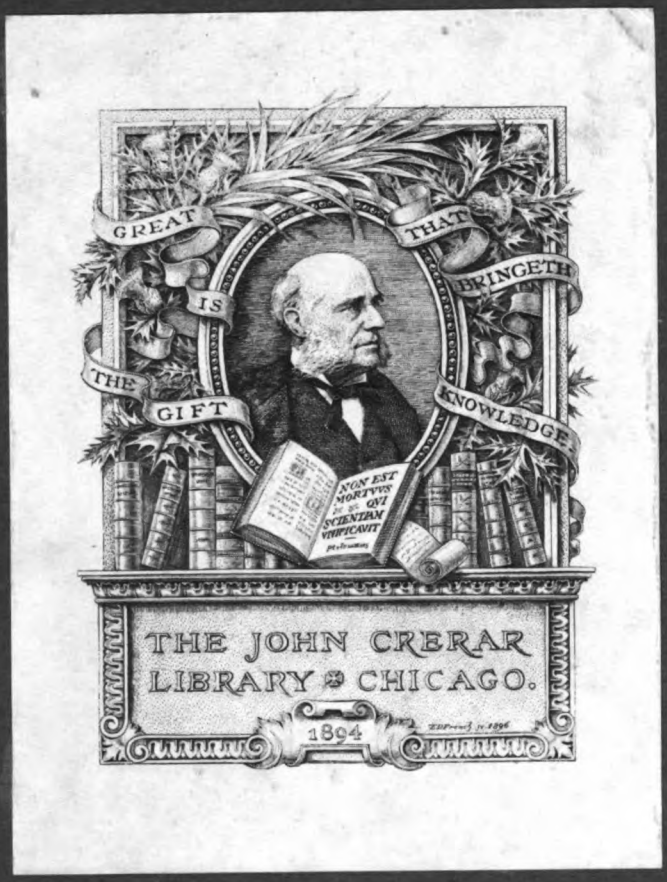

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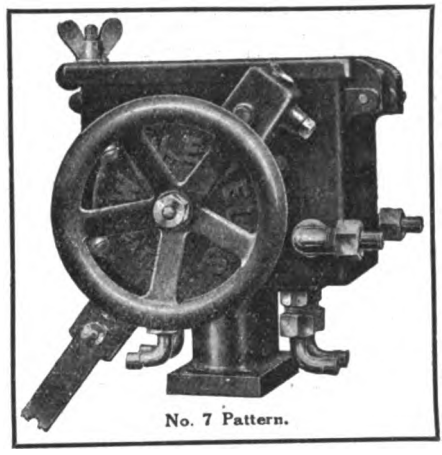

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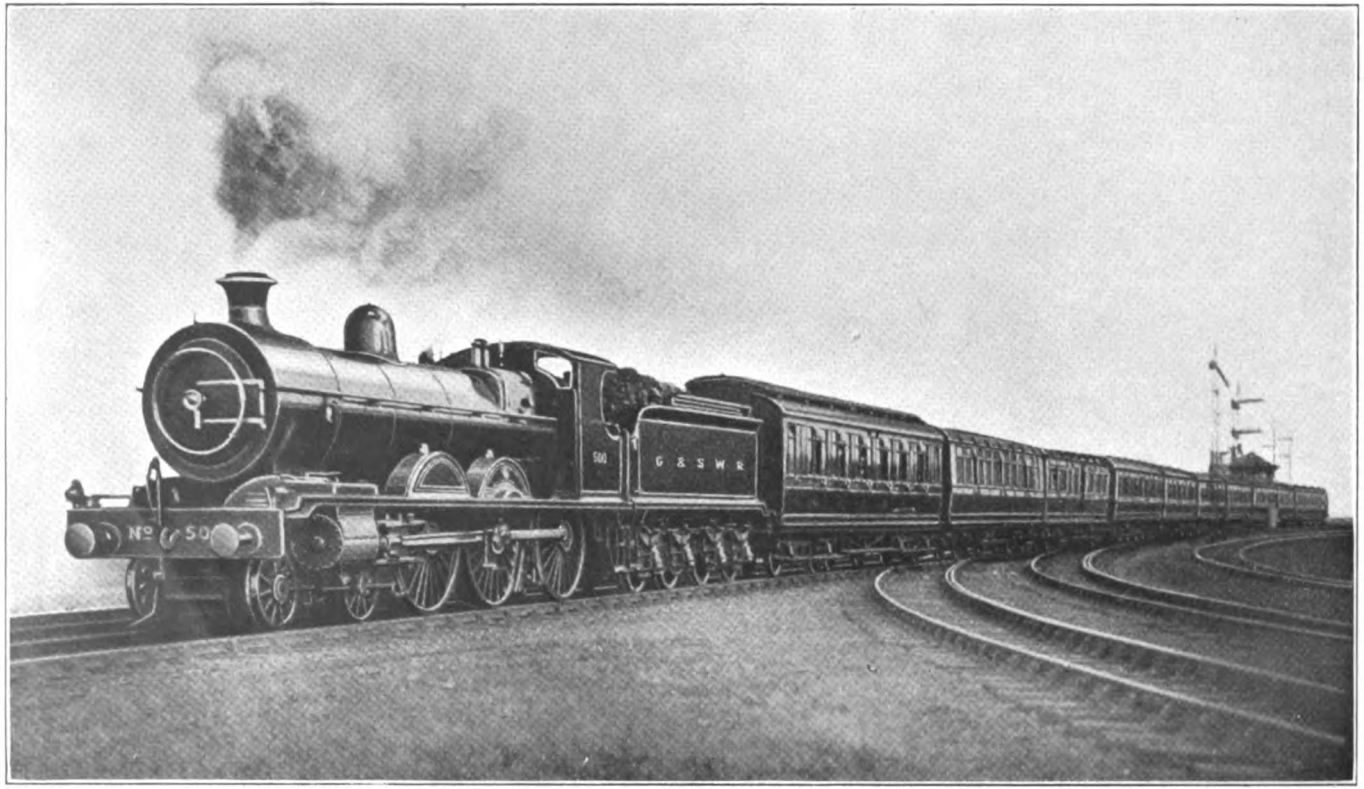

GLASGOW & SOUTH WESTERN RAILWAY, LONDON-GLASGOW EXPRESS.

4-6-0 Rebuilt Locomotive, No. 500.

From a Photograph by F. E. Mackay.

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GENERAL VIEW OF CONCOURSE.

Notable Railway Stations and their Traffic.

ABERDEEN JOINT PASSENGER STATION: CALEDONIAN AND GREAT NORTH OF SCOTLAND RAILWAYS.

By J. F. GAIRNS.

As the third largest city in Scotland, a great fishing port, and an important industrial and agricultural centre, Aberdeen is necessarily the objective or source of railway traffic on a considerable scale, and nearly all is dealt with *via* the Joint Station or, on the goods side, the extensive yards adjoining. For traffic purposes three railways are concerned, Caledonian, North British and Great North of Scotland, the two former introducing direct associations with all the lines composing the main trunk routes from London and other towns in England to the north of Scotland. In the case of the North British Railway, however, access to Aberdeen is obtained only by virtue of running powers over the Caledonian Railway from Kinnaber Junction, some 38 miles to the south of the "Granite City," so that only the Caledonian and the Great North of Scotland Railways share in the ownership of the Joint Passenger Station.

Prior to 1867 the Great North of Scotland had its terminus, for both passenger and goods traffic, on the side of the harbour at Waterloo Quay, about half a mile from the present station, while the Aberdeen Railway (afterwards merged into the Scottish North Eastern Railway, now part of the Caledonian system) had its terminus in a small station approximately on the site of the Caledonian Company's present Guild Street Goods Depôt. The Aberdeen Company's station also accommodated Deeside Railway trains.

The hiatus then existing between lines north and south of Aberdeen early called for connection, and so in 1867 a jointly-owned station for passenger and goods traffic was opened, to be used by al

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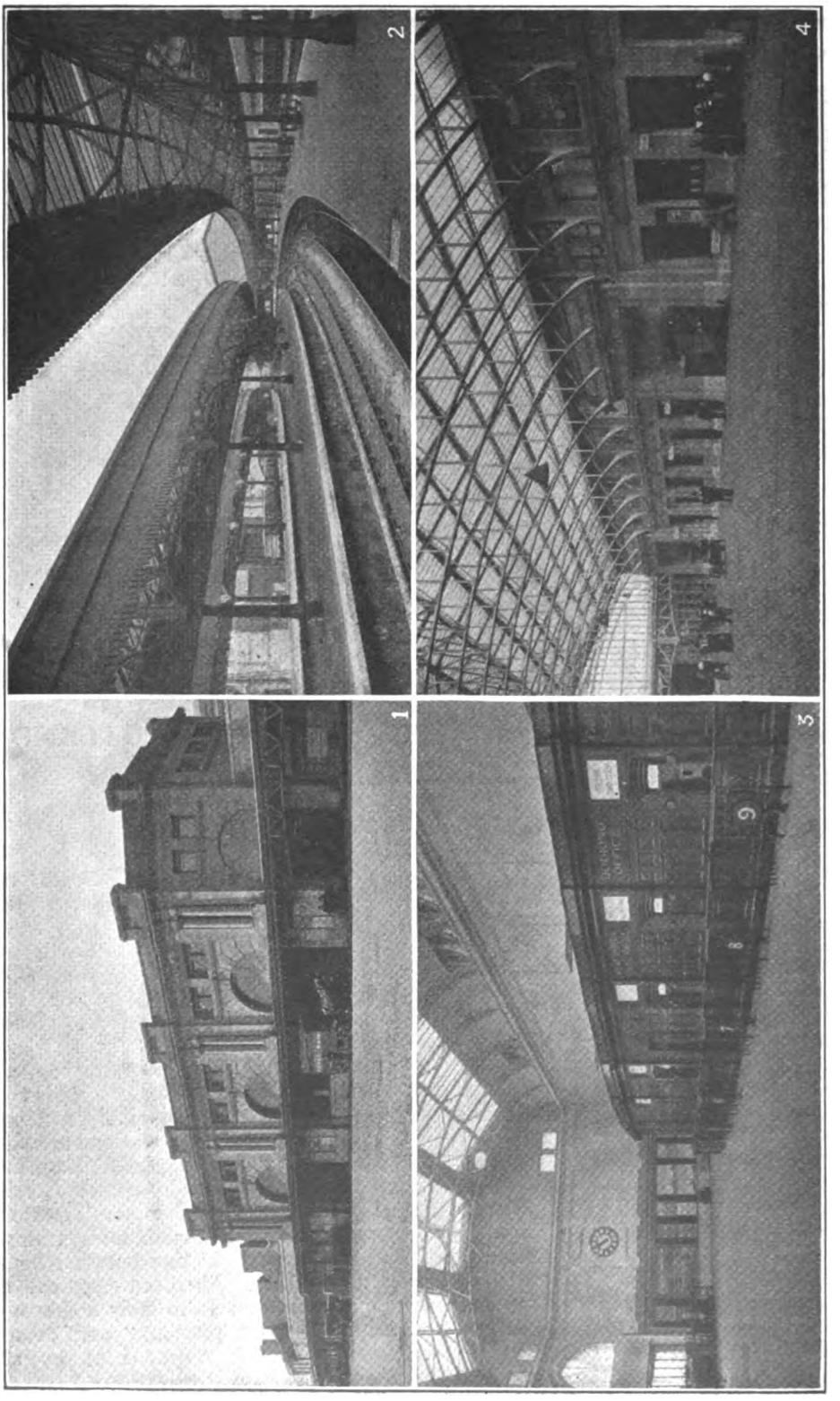

1.—MAIN BOOKING HALL AND STATION BUILDINGS.
2.—PLATFORMS AT SOUTH END OF STATION.
3.—INTERIOR OF BOOKING HALL.
4.—CONCOURSE AND STATION BUILDINGS.

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the railways then concerned—the Great North of Scotland, Deeside and Scottish North Eastern as owners, and the North British by running powers. With the absorption by the Great North of Scotland Railway of the Deeside Company in 1875, the ownership became dual, Caledonian (as successors to the Scottish North Eastern) and Great North of Scotland, with the North British as running-power tenants of the former company.

The old joint station dates from 1864, and was opened for traffic November 4, 1867. It had two through lines for passenger traffic, one only with a passenger platform, and two through lines for goods traffic to the west of the passenger part of the station, with two bay lines to the north, and three to the south.

As there is a considerable volume of interchange traffic, the single through platform line in the main station became very much overtaxed, during more recent years, and therefore in 1913 entire reconstruction and enlargement of the station was commenced, and completed early in 1915. For this work, Mr. J. A. Parker, M.Inst.C.E., Chief Engineer, Great North of Scotland Railway, was responsible as engineer to the Joint Station Committee; the contractors being Messrs. P. and W. Anderson, Limited, of Glasgow.

This reconstruction had to be carried out without interfering with traffic on the same site, but was completed in remarkably short time, a start being made on May 28, 1913, while in October, 1914, the last remnant of the old station was removed. Now there are no fewer than 13 platform lines (four of them through and the longest extending for 1,596 ft.), aggregating in length 11,340 ft., making Aberdeen Joint station one of the most convenient in Great Britain. Architecturally it is distinctive, and in this respect Aberdeen Joint is entitled to be included as one of Britain's finest railway stations. Indeed, partly because it is a new station, but also in view of the special care taken to retain the wonderful suggestion of cleanliness and neatness which seems to characterise the station, Aberdeen Joint conveys to the visitor a unique impression of brightness and orderliness. Everywhere the overhead glazing is kept scrupulously clean, while the many examples of splendid cabinet work receive daily attention to prevent dust accumulating in crevices and corners.

The general design and construction of the station was fully described in the RAILWAY MAGAZINE, October, 1915, so that it is only necessary to refer to the principal features in this respect, before proceeding to consideration of the traffic and work of the station.

The special feature is the spacious concourse and the booking hall, and their adjacent premises. The station yard, a wide area communicating with Guild Street, gives splendid road access. Along the frontage of the station is a verandah-covered pavement leading to steps passing under an arched portal direct to Guild Street immediately opposite the head offices of the Great North of Scotland Railway Company, while doorways communicate with the booking hall and the parcels offices of the railways using the station.

An artistic glazed roof ensures good lighting to the booking hall, which is distinctive for spaciousness and the splendid woodwork of the ticket section, with 10 booking windows, and other offices. The booking hall also accommodates the luggage weigh office, lost property office, a window for shop parcels and a cab office, while a large electric clock on the south wall is another distinctive feature.

Passing through either of two wide corridors, the main concourse is reached, covered by a fine glass and steel roof, 245 ft. long and 97 ft. wide. Immediately opposite, approaching from the booking hall south corridor, is a block of buildings containing bookstall, stationmaster's office, and Telegraph Office at platform level, and overhead a large train information indicator. On either side of this block are wide stairs giving access to a footbridge which leads to platforms Nos. 7, 8, and 9 on the west side of the station. From the concourse direct access is had to Nos. 1, 2, 3, 4 and 5 south terminal lines, No. 6 through line, and Nos. 10, 11, 12 and 13 north terminal lines. At the north and south ends of the concourse are small buildings containing fruit stall, tobacco stall, and the Passenger Agents' Offices of the Great North of Scotland, Caledonian and North British Railways.

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Along the main wall, north and south of the booking hall, are the following offices: gentlemen's lavatories, Great North of Scotland Railway parcels office, ladies' third-class and first-class waiting rooms, gentlemen's waiting room, tea and refreshment room, corridor from booking hall, dining room, first and third-class refreshment rooms, corridor from booking hall, left luggage and bicycle office, Caledonian and North British Railway parcels offices, hair-dressing saloon with bath and dressing rooms and gentlemen's lavatories.

Special mention may be made of the dining room and the hair-dressing saloon. In view of the arrival of sleeping-car trains from England in the neighbourhood of 7 to 8 a.m., there is a large call for breakfasts, following a bath, so that in the course of the season large numbers of long-distance travellers avail themselves of these facilities. The dining room is a splendid apartment, 41 ft. long and panelled in mahogany and floored with mosaic. The service is exceptionally good, and a wide selection of viands is available for passengers at all times. Indeed, many business people in the town make regular use thereof for lunch. The dining and refreshment rooms are under the direct supervision of the Great North of Scotland Railway hotel department.

From the concourse the platforms extending north and south are protected by verandah roofs, almost for their entire lengths. Guild Street is carried over the station a little to the north of the concourse, and at the corner of Bridge Street is a small booking hall, with book and tobacco stalls, and connected by a footbridge leading to the platforms. Near the north end of the station is Windmill Brae footbridge, a public right-of-way not connected with the platforms, while from No. 6 is a covered slope and footbridge leading directly into the Great North of Scotland Railway Company's "Palace Hotel," claimed to be, and deservedly so, the finest hotel in Aberdeen. Connected directly with the station, and with porters attending upon passengers arriving or departing, this hotel is exceptionally convenient.

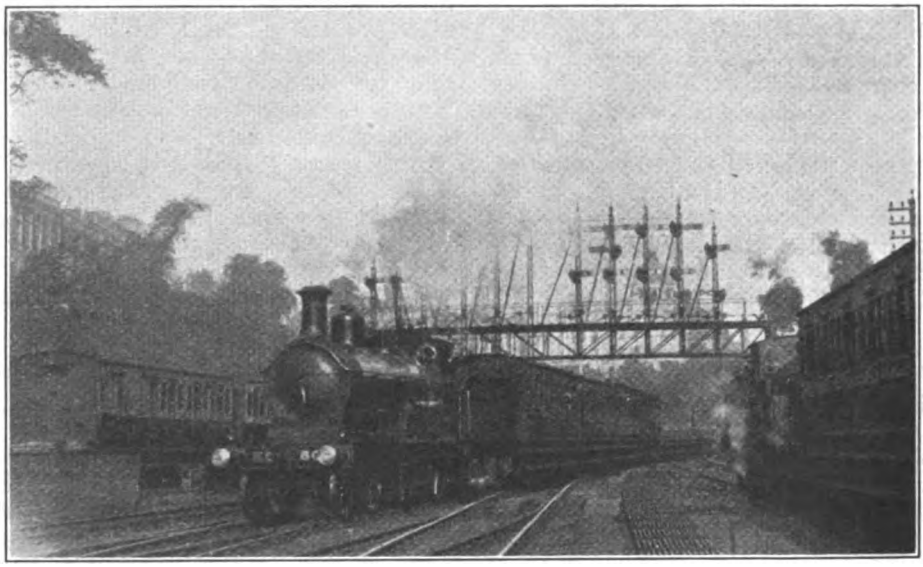

Photo.] G.N.S.R. TRAIN ARRIVING FROM THE NORTH. [*J. F. Gairns.*

During the shooting season as many as 70 sleeping car passengers may reach Aberdeen in one morning, and while many travellers have a bath and breakfast in the station, large numbers find it convenient to proceed to the hotel and to stay for a day or two before continuing their journeys. Aberdeen is, indeed, a good centre in itself, as journeys can be made

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conveniently in all directions therefrom, while the town contains much of interest, and has a fine sandy beach and coast attractions, and a number of excellent golf courses within easy walk or a short tram ride. The Palace Hotel, together with the Station Hotel in Guild Street, also owned by the Great North of Scotland Railway Company, is, therefore, largely patronised both by business men and by holiday travellers, while the fact that Aberdeen is on the route to Deeside and Ballater (for Balmoral) and the estates of many Scottish notabilities, causes the Palace Hotel to be frequently visited by our own and foreign royal personages and others.

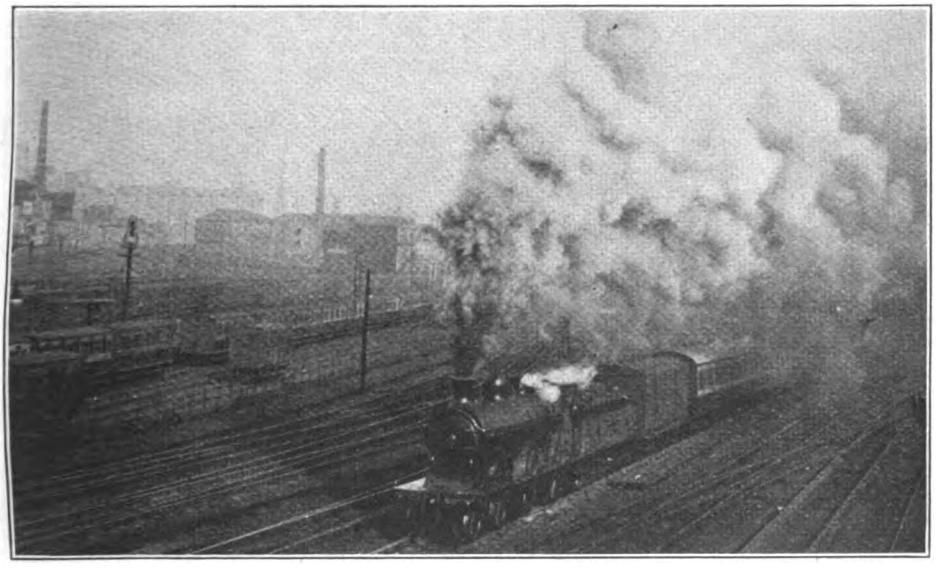

Photo.] C.R. PULLMAN CAR EXPRESS LEAVING FOR THE SOUTH. [*J. F. Gairns.*

The Palace Hotel has 81 bedrooms, and besides its private apartments, including a lounge, at one time Queen Victoria's private suite, has public dining rooms approached directly from Union Street, which are in great favour with town residents and visitors. The hotel is also frequently used for balls and public dinners, while when the Court of Sessions is sitting it becomes the scene of judicial hospitality and of city functions associated therewith. The Station Hotel is devoted more to commercial and family purposes. It has 49 bedrooms. Both hotels are under the direction of Mr. A. A. Ryan, Mr. G. Souter being assistant manager. During the war the Palace and Station hotels were largely used by naval and military travellers, as Aberdeen was an important naval centre. It also provided the only route to Russia then available.

Returning to the station, beyond No. 1 platform is a horse and carriage loading dock accessible from the courtyard, and adjacent is a double-sided fish platform. Here the special fish trains are loaded for the south, usually two Caledonian and one North British, daily, and as the lorries bring up the fish from the market, past the weigh office and alongside the wagons, the scene is a busy one. The platform is of considerable width, but at times, to avoid conflicting movements of road vehicles, a bascule bridge (with interlocking gear) is lowered across one line near the south end of the platform, so that the lorries can pass to the roadway serving the horse and carriage loading dock, and so to the station courtyard and away. To the east of the fish-loading bank are the Caledonian Company's Guild Street goods yard (used also by North British trains) and the Deeside goods yard of the Great North of Scotland Railway.

On the opposite side of the station, at the south end, are the Clayhills high level and low level sidings, with exchange

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lines wherein through goods trains from the north or south are transferred between the three railways concerned. The high level sidings are partly used for storage of passenger rolling-stock, including the joint stock trains on the English services.

At the north end of the station, spanned by the magnificent arch which carries Union Street over the railway, space is somewhat limited. At this end is a north traffic horse and carriage loading dock, while Hadden's sidings provide limited carriage storage accommodation. Alongside Union Terrace Gardens are the Terrace sidings and the turntable, but there is not much space to spare here, so that the Great North of Scotland Railway is still compelled to stable many of its trains out of service at Kittybrewster.

From the north two lines only are available, leading to Nos. 9, 8, 7 and 6 through lines and to terminal platforms Nos. 10, 11, 12 and 13. Traffic at this end is controlled by Aberdeen North signal cabin (127 levers and 23 spare). Southwards the station lines lead to the main and west up and down lines, with up and down goods lines, and a shunting spur on the east side. Aberdeen Centre box (60 levers) controls traffic within the station, while the large Denburn South box (217 levers and 23 spare) deals with passenger and goods traffic to the south. There are also two ground frames operating the scissors crossings between Nos. 2 and 3 and 4 and 5 terminal lines, under electrical control.

A notable feature of traffic at Aberdeen is the suburban traffic operated by the Great North of Scotland Railway north and west. Notwithstanding the competition of the Corporation tramways, these trains, worked by 0-4-4 tank engines, convey a considerable volume of residential traffic. To Culter, on the Deeside line, trains usually leave No. 9 platform, while Dyce trains, to the north, use Nos. 7 or 8. In both cases the service is at least hourly, and at busy periods more frequently. As a rule the engines run round their trains at Aberdeen, by means of the crossovers available, but certain trains work through, complete, between Dyce and Culter.

To a considerable extent the platforms are regularly allocated to particular services, substantially as follows :—

No. 1. Caledonian locals.
,, 2. Caledonian main line.
,, 3. North British.
,, 4. Deeside.
,, 5. As required.

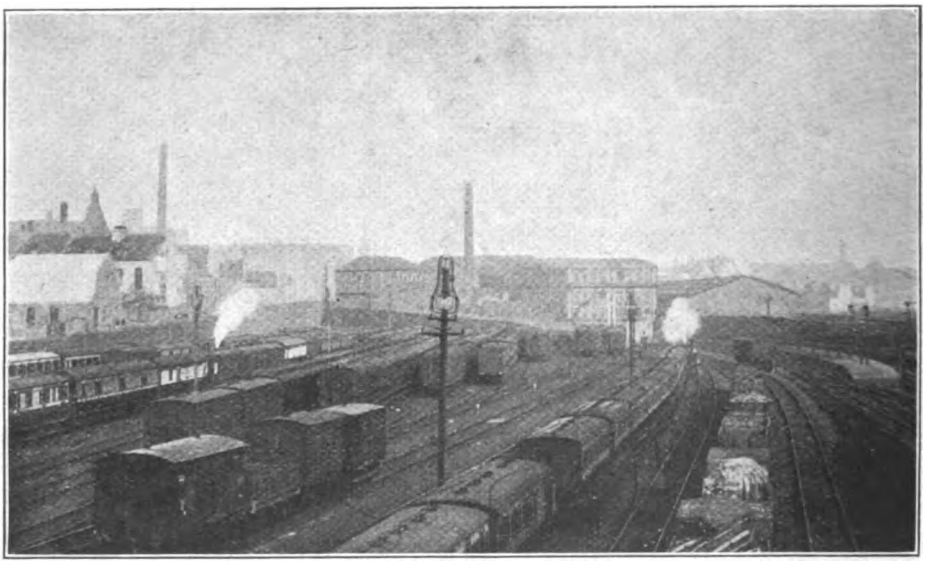

Photo.] CLAYHILLS SIDINGS, JOINT STATION TO RIGHT [*J. F. Gairns.*

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No. 6. As required and through transfer.
,, 7. } Dyce suburban.
,, 8. }
,, 9. Culter suburban.
,, 10. Keith, Elgin, Inverness, &c.
,, 11. Peterhead, Fraserburgh, Cruden Bay.
,, 12. Macduff and Alford.
,, 13. As required.

On the Caledonian side there are the special Pullman and restaurant car expresses between Aberdeen and Glasgow, the services to Edinburgh, and to England via the West coast route, and the special "Limited Mail" trains. There are also slower and local trains. North British services consist mainly of the through Edinburgh-Aberdeen and East Coast expresses.

About 200 trains are normally dealt with daily, but in the season these totals are considerably increased, and during the times of special holiday pressure, and in connection with the Aberdeen spring, summer and autumn holidays, and at the New Year, the station is often used almost to its full traffic capacity by the relief and additional trains run. Other events which produce much special traffic are the Highland Cattle Show, and the Glasgow holiday week. On the last occasion (1920) about 15,000 passengers were booked from Glasgow to Aberdeen, or to places involving change here to the Great North of Scotland Railway.

A large proportion of the trains dealt with are of a main line character, so that luggage and the more complex features of station work are generally involved in a considerable degree. The work entailed by the departure of the Glasgow, Edinburgh and English expresses, and on their arrival, is frequently very heavy, while the numerous services of the Great North of Scotland Railway, and the mail business, combine to render the station a scene of animation at all periods of the day. In general the station is an open one, but portable barriers are erected when it is desired to close off any platform.

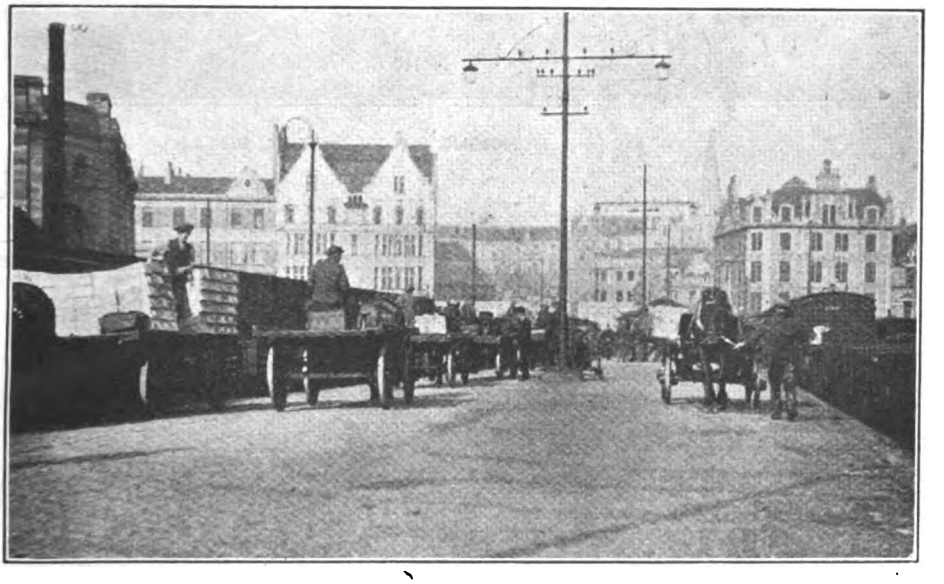

Photo.] FISH-LOADING PLATFORMS. [*J. F. Gairns.*

In pre-war days a special feature of Great North of Scotland traffic was the express excursions on Wednesdays and Saturdays to Ballater, Boat of Garten, Elgin, Cruden Bay, &c., and although excursion facilities can as yet only be given in an attenuated form, and at rates which will not compare with those of 1913, a large traffic is conducted at ordinary or 1920 excursion fares on all routes. Some of the tours operate in conjunction with the well-known motor omnibus routes

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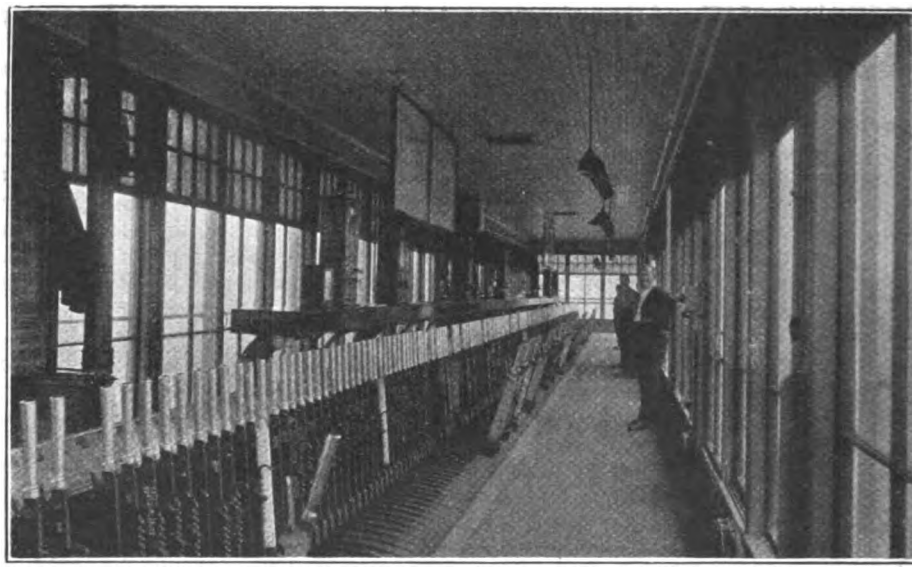

INTERIOR OF DENBURN SOUTH SIGNAL BOX.

for which the Great North company is noted, as between Ballindalloch and Tomintoul, Alford and Kildrummy and Strathdon, Fraserburgh and Rosehearty and New Aberdour, Ballater and Braemar, Huntly and Aberchirder, Aberdeen and Newburgh, Cluny, Echt and Midmar, and the famous Three Rivers Tours by "Rail, Motor and Coach via the Dee, Don and Spey."

During the past season, excursions have also been operated by the Caledonian Company to Muchalls and Stonehaven, and other places along the rocky Kincardineshire coast, which the railway follows so closely for many miles.

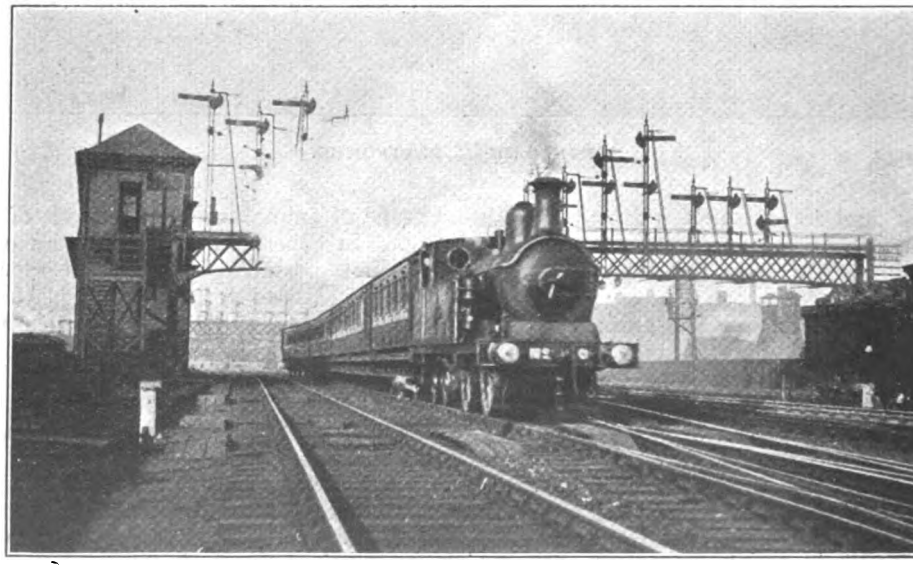

Photo.] [*J. F. Cairns.*

G.N.S.R. SUBURBAN TRAIN PASSING DENBURN SOUTH SIGNAL CABIN.

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Golf is also a great attraction, and it is sufficient to mention Cruden Bay, and the Great North of Scotland Company's hotel there, together with other courses served by the railways concerned, to appreciate that this is no small factor in the traffic passing through Aberdeen.

As a principal fishing centre Aberdeen itself sends about 60,000 tons of fish to the English markets, but a great deal passes through. During the herring season Fraserburgh and Peterhead alone provide 14,000 to 15,000 wagons of fish for the south, exchanged at Aberdeen. During the war period the Aberdeenshire coast served one of the licensed fishing areas, and in 1918 no fewer than 12,000 tons of fresh herrings, kippers, &c., passed through Aberdeen during June, July, August and September. In 1919, the total was about 8,000 tons, and in 1920 6,000 tons, against 2,500 tons in 1912. These exceptional totals were partly due to the conditions existing during the war period, and the closing of German and Russian ports for general fishing traffic, but in any case they would be very high.

Including that landed at Aberdeen and the traffic passing through from the Great North of Scotland Railway, the Caledonian and the North British Companies deal with about 89,000 tons of fish annually at Aberdeen, representing some 270,000 parcels of fish conveyed by passenger or special fish trains.

A total of some 3,000,000 passengers per annum use Aberdeen Joint station, exclusive of season-ticket holders. Bookings here are heavy, but large numbers of passengers have through or return tickets, so that exact figures are difficult to estimate. Among the special features of the traffic may be mentioned the annual migrations of fishworkers who travel from the fishing centres on the Great North of Scotland Railway to Lowestoft and Yarmouth for the herring season. These girls often number 3,000 or more, and on the occasion of his recent visit to Aberdeen the writer was enabled to witness the departure of a special conveying some 300 or so to East Anglia.

Also affecting the passenger station is a large traffic in milk, horses, and pedigree cattle, conveyed by passenger train, while 800 to 1,000 wagons of exchange goods traffic pass through the station daily.

During the war period Aberdeen was exceptionally busy, as an important naval centre. Mr. J. MacGregor, O.B.E., the Caledonian District Superintendent, whose offices are in Guild Street, close to the station, records 185 ambulance trains conveying 21,627 sick and wounded soldiers or sailors, while the naval stores dealt with reached enormous totals.

The staff of Aberdeen Joint station is regarded as joint on the traffic working side. Mr. D. McNicoll, M.B.E., occupies the responsible post of stationmaster. He is assisted by Inspector Bruce (from G.N.S.R.) and Inspector Collins (from C.R.), with a staff of about 100, including

MR. D. McNICOLL, M.B.E.
Stationmaster, Aberdeen Joint Station.

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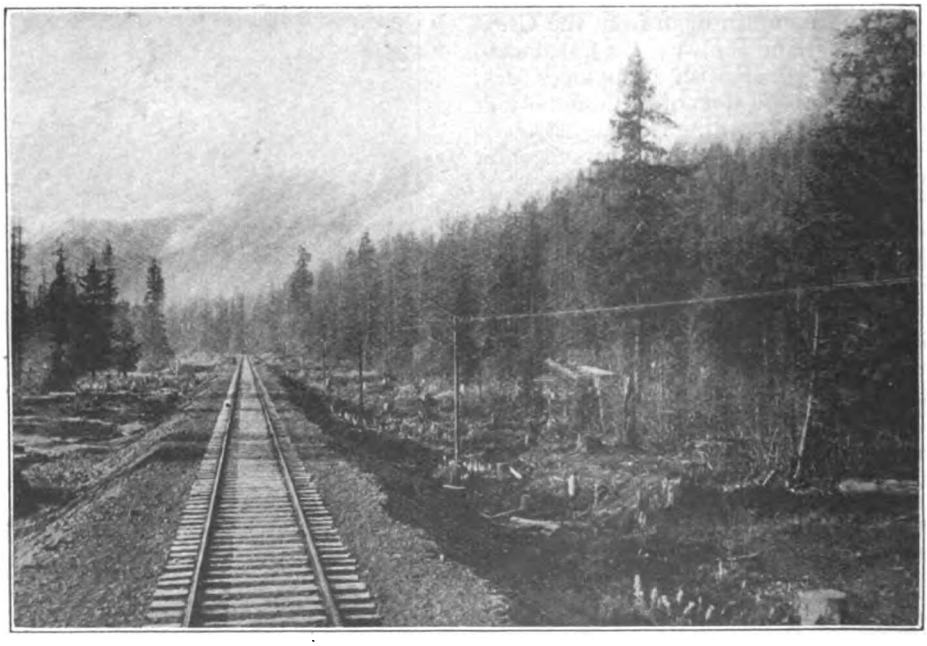
clerks, foremen, policemen, signalmen, shunters, porters, &c.

Besides these there are about 170 other employees engaged in traffic peculiar to one or other of the three companies concerned. Mr. J. Lamont, Passenger Agent, Mr. D. Gibb, Parcels Agent, and Mr. W. Greig, Booking Agent, deal with the commercial side of Caledonian traffic. Mr. J. McNeil is North British Agent, Mr. J. Bremner is G.N.S.R. Parcels Agent, and Mr. J. Kemp is G.N.S.R. Booking Agent. Speaking generally, therefore, each company looks after the business side of its own traffic, except that to some extent North British traffic is covered by Caledonian or Caledonian and North British joint staff, while the traffic working of the station proper is under the supervision of the stationmaster, who receives his instructions from the headquarters of the owning companies. Mr. T. S. Mackintosh, Secretary, Great North of Scotland Railway, acts as Secretary, Aberdeen Joint Passenger Station Committee.

In conclusion, the writer is indebted to Mr. G. Davidson, General Manager, Mr. W. Johnston, Superintendent of the Line, Mr. J. A. Parker, Chief Engineer, and Mr. A. A. Ryan, Hotels Manager, Great North of Scotland Railway; to Mr. R. Killin, C.B.E., Superintendent of the Line, and Mr. J. MacGregor, O.B.E., District Traffic Superintendent, Aberdeen, Caledonian Railway; and to Mr. McNicoll and his staff, and representatives of other railways, for many courtesies and for valuable assistance in collecting material for this article.

THROUGH THE FORESTS OF THE FAR NORTH.



A PICTURESQUE VIEW ON A NEW GOVERNMENT RAILWAY IN ALASKA.

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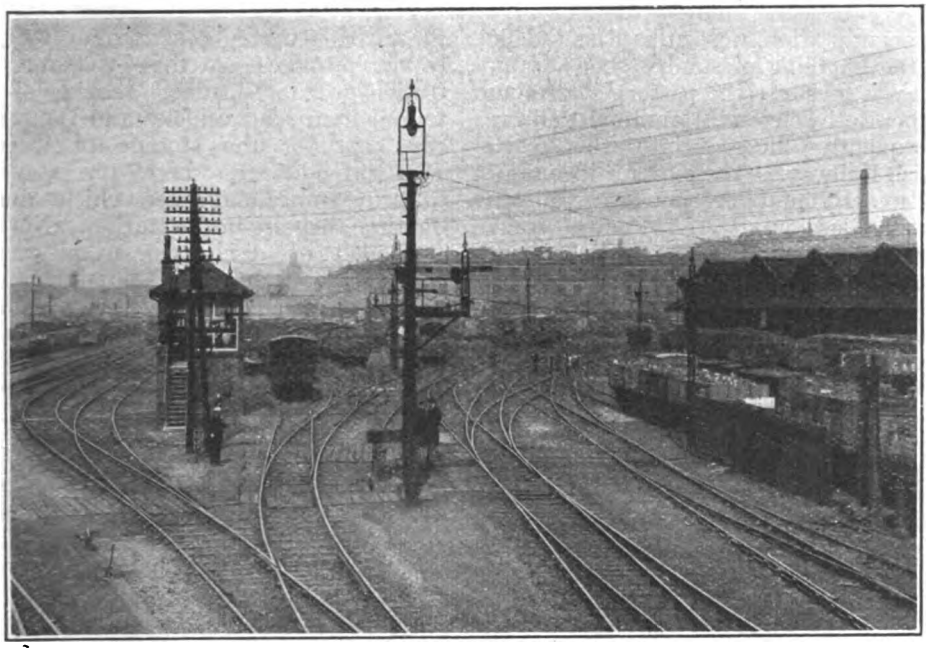

GENERAL VIEW OF GOODS SHED AND YARD, HIGH STREET, GLASGOW.

High Street Goods Station, Glasgow,

NORTH BRITISH RAILWAY.

FORMERLY known as College Station, after being remodelled and enlarged, this depôt was re-opened on August 1, 1907, and the name changed to High Street. It occupies a central position in the City of Glasgow, in the heart of an extensive industrial area, a few minutes' walk from the North British Railway passenger terminus at Queen Street. The frontage faces on High Street, Glasgow, with an imposing red brick design, a block of offices forming the centre. A considerable area round the west end of the building gives access to all parts of the station and yards.

The main building is of considerable area, and at the loading level possesses six platforms directly served by rails, one being an island platform. Each bay (or platform) of the building is classified for specified traffic, thus :—

No. 1.—East and south of Scotland, and traffic via the Waverley route.

No. 1A.—East Coast traffic, Leith and Edinburgh.

No. 2—. Helensburgh, Balloch and branch lines, also West Highland Railway stations.

No. 3.—Tranship.

No. 4.—North traffic, Aberdeen and stations in Fife, &c.

No. 5.—Berwick, Newcastle and England.

Below the main building there is an extensive basement covering an area of 3½ acres. This is used as a bonded stores by a leading firm of spirit merchants in Glasgow as lessees from the North British Railway Company, while on the first and second floors above the platforms there is a large area available for warehousing purposes.

Of steel construction, with red brick facing, the main building measures 490 ft. by 315 ft., and is served by 10 pairs of rails entering from outside.

Tracks within the building are spiked direct to concrete flooring. Indeed, the flooring at all levels is of concrete, and very complete drainage is thus secured.

Connected with the High Street Station by a girder road bridge is the old College

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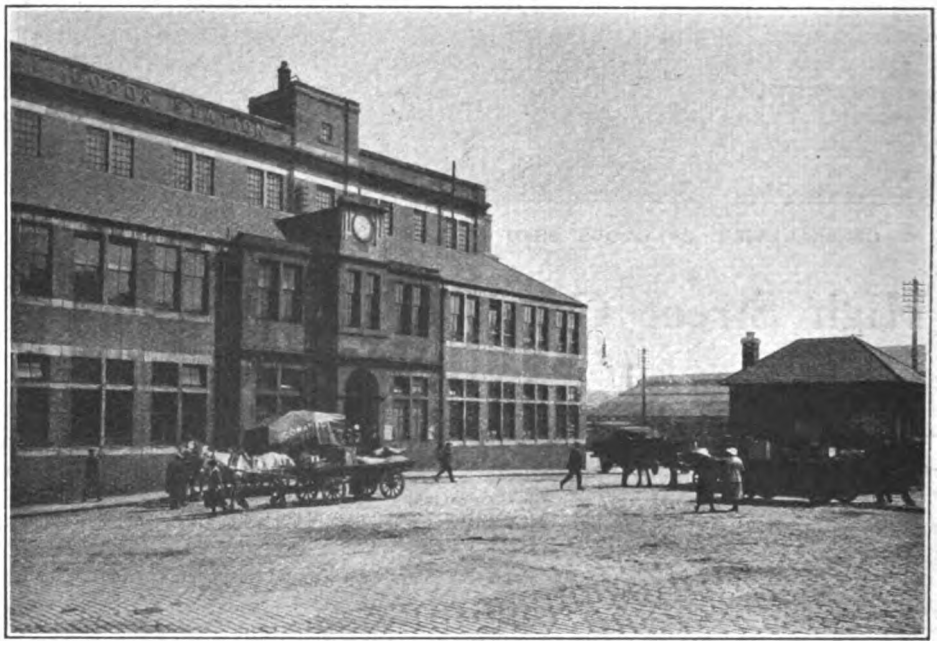
passenger station, now utilised as a depôt for the handling of sundry goods traffic. This was formerly the passenger terminus of the Bothwell and Hamilton Railway, subsequently merged into the North British Railway. The girder bridge spans the underground or low-level railway through Glasgow.

When the station was remodelled and extended, the track system was improved and a new tunnel driven to accommodate an additional double track, this widening embracing a distance of about three miles, to Camlachie, where the line consists of one up and one down road towards Edinburgh.

On the south side there are eight reception or storage sidings whereon exchanges of traffic to and from the Glasgow and South Western Railway are dealt with, also traffic arriving for High Street itself. The latter traffic is shunted out of the arrival sidings and transferred to the discharge sidings and shed roads to be unloaded there.

Access is provided to the wagons standing on the sidings in the central yard by two roadways, both of which are laid with stone setts. The group of three roads in the centre is utilised for traffic purposes so that the outward tracks are for loading and unloading to and from road vehicles and the centre one kept for the storage of wagons. This provides the necessary standing room for empty and other vehicles during the time they are in the station. Nothing is loaded or discharged from wagons on these tracks unless it is possible for the work to be done by hand. Any consignments not so adaptable are taken to other parts of the yard where crane facilities are available.



GOODS OFFICES, HIGH STREET, GLASGOW.

Other tracks lying between the arrival sidings and the main shed give access to the loading bank, three parts of which are roofed over. The loading bank accommodates 35 wagons on each side. At this part of the yard there are other tracks served by a 40-ton Goliath crane. There are in reality three yards in connection with the station, and the details of these may be summarised as follows :—

(1) Warehouse yard, comprising six warehouse sidings capable of accommodating 100 wagons, in addition to which other sidings in this yard provide space for a further 95 wagons.

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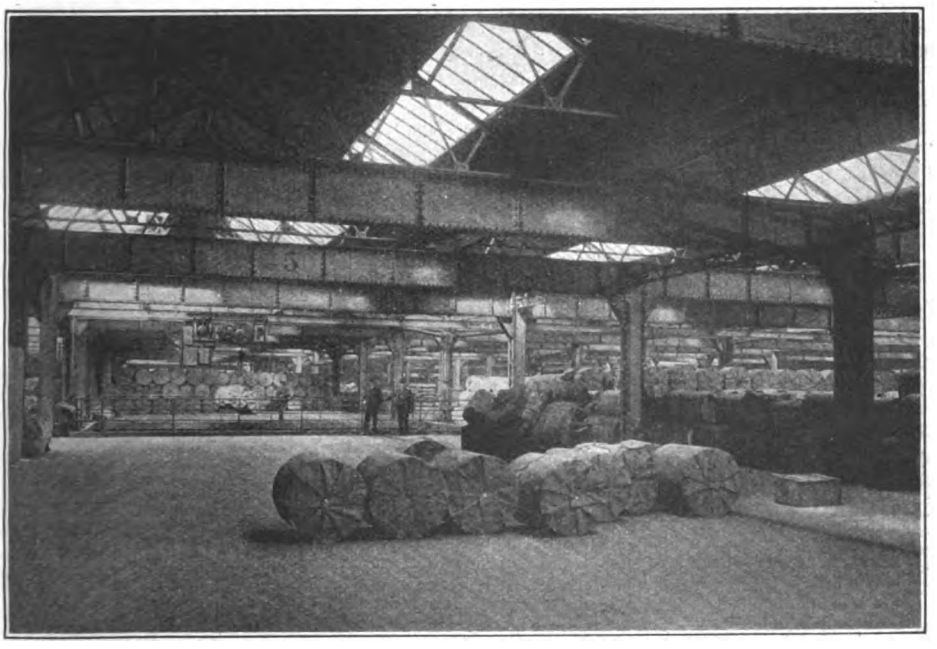
(2) Centre yard, in which there are 13 shed roads, capable of holding 300 wagons, and in addition four other carting sidings with accommodation for about 100 wagons. Also three crane roads holding 40 wagons.

(3) South yard. This is principally used for exchange traffic to and from the Glasgow and South Western Railway. There is accommodation in it equal to about 200 wagons.

It will thus be seen that there is a total accommodation in the three yards equal to about 835 wagons.

The last lorry leaves the station about 3.30 p.m., the discharge of traffic being continued up to about 2 p.m. In the case of traffic for despatch, lorries begin to arrive with loads sometimes as early as 8.10 a.m., and from then until closing time. Pressure of forwarded traffic commences about 3 p.m., lorries arriving about that hour in considerable numbers and continuing until closing time. Loading of sundry traffic for despatch dealt with in the shed commences about 3 p.m., and is usually finished about 7 to 7.30 p.m. The number of lorries entering



VIEW ON TOP FLOOR OF DEPÔT.

At intervals during the 24 hours a report is sent to the Control Office at Coatbridge from High Street relating to empty and loaded wagons on hand, also information respecting special classes of wagons. On an average about 85 trains are dealt with in the 24 hours in the various yards at High Street goods station.

The number of wagons dealt with daily is approximately 400 forwarded-loaded and 400 received-loaded. Discharging of wagons commences at midnight and the first lorry is usually loaded at 7.30 a.m., getting clear of the station by 7.50 a.m. and leaving the station is 380 to 390 inward and 180 to 190 outward.

Three pilot engines are employed at High Street Station, one being engaged continuously in each yard during the 24 hours. Two shunters work in conjunction with the pilots in the centre and south yard, and three shunters in the warehouse yards. In addition a pilot engine is provided between 11 a.m. and 8 p.m. daily to work in the old passenger station yard and barracks depôt, both of which are in close proximity to and form part of the High Street goods station. Additional staff employed in connection with the

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shunting of goods traffic at High Street comprise three inspectors covering the 24 hours and six marshalmen.

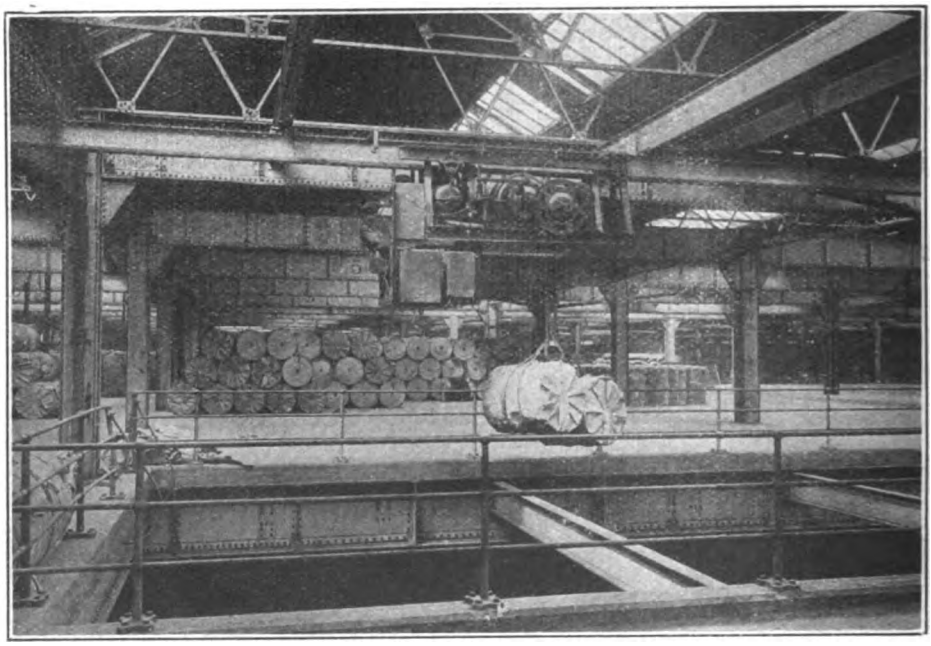
Shunting movements within the goods yard are controlled from a signal box in the centre, fixed signals being employed for the majority of the movements. Before any movement can be made towards the main goods or passenger lines, permission of the main line East Junction signalman must be obtained, nterlocking being in force between High Street East Junction (main line) and High Street goods station cabins. Owing to the restricted marshalling facilities at High Street goods station a good deal of the marshalling of the traffic is dealt with at Sighthill depôt on the one hand and Shettleston on the other.

Incoming traffic by rail enters the station from the main line via Bathgate, at College East Junction, which point also marks the junction between the North British and Glasgow and South Western Railways. The latter company's goods depôt, known as College Station, adjoins the North British Railway Company's yard on the south side.

Outgoing traffic is worked from High Street to Cadder marshalling yard, some 6 miles from Glasgow, in rough trains for marshalling at that yard.

Electrical equipment at High Street is of a very efficient and modern character, making this station one of the most up to date of its kind in the country. Travelling electric overhead cranes, transporters and jiggers are installed at all necessary points, making it possible to move goods from any part of the shed to another with the least amount of trouble and expenditure of time, thus ensuring rapidity in the removal, loading and unloading of consignments.

The 40-ton Goliath crane already mentioned lifts consignments from road vehicles direct to railway wagons and *vice versa*, dealing, among other things, with castings of various descriptions weighing from 1 ton or less to as much as 40 tons. This crane was supplied by Royce, Limited. Particulars are as follows:—



VIEW ON TOP FLOOR SHOWING TRANSPORTER CONVEYING CONSIGNMENT.

Longitudinal travelling, 150 ft. per minute, 21 h.p. motor at 400 revolutions.
Cross travelling, 100 ft. per minute, 6½ h.p. motor at 400 revolutions.
Main lift, 7 ft. per minute, 31½ h.p. motor at 400 revolutions.
Auxiliary lift (6 tons), 50 ft. per minute, 31½ h.p. motor at 400 revolutions.

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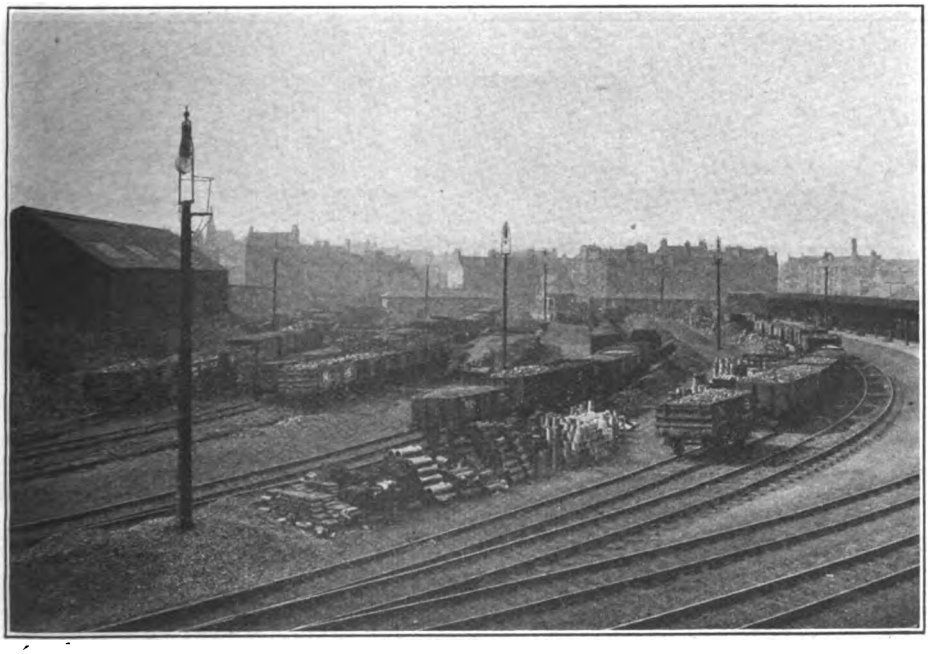
The longitudinal travel has a range of 200 ft., and a cross travel with a range of 50 ft. The height of lift above wagon rails is 22 ft.

The station is equipped with 15 overhead electric travelling cranes of the underslung jib pattern. Thirteen of the cranes are capable of lifting loads of 30 cwt., and the remaining two will handle loads up to 3 tons. All movements can, with these cranes, be carried out simultaneously, *i.e.*, lifting, slewing and travelling. The total lift from the level of the goods platform is 12 ft., and if required the cranes can pick up from rail level, representing a lift of 16 ft., whilst operating within a radius of 23 ft. As stated, the cranes are of the revolving jib pattern. They were supplied by Cowans, Sheldon and Co., Limited, of Carlisle, and have a speed of 400 ft. per min., the span covered by the cranes being 24 ft. 10 in. The revolving jib is balanced and requires but small power to move it, the complete sweep or radius of 24 ft. being rapidly completed, either whilst the crane proper is stationary or travelling from one point to another.

The overhead cranes work in 14 bays on runways, each having one crane except the bay at the east end wherein are located the two 3-ton cranes, to allow of exceptionally heavy lifts being made at a point where cartage is not immediately accessible. Each platform is equipped with an electric hoist at both ends, two hoists serving the three platforms at the west end. These hoists are of 30 cwt. capacity each.

In addition to the crane installation referred to above, there are installed at High Street Station eight transporters, four on each of the two upper floors, these being for the purpose of lifting goods from the level of the ground floor to that of the floors above. They are capable of dealing with loads up to 1½ tons. These transporters, which were supplied by Royce, Limited, Manchester, are mounted on H section girders, and operate through special openings or "wells" in the floors, the total lift from the ground floor to the top of the building being 64 ft. The transporters run transversely along the building on the top and second floors, each one feeding three well openings. Some of the wells give access to and from the railway wagons



BARRACKS SIDINGS FROM BRIDGE.

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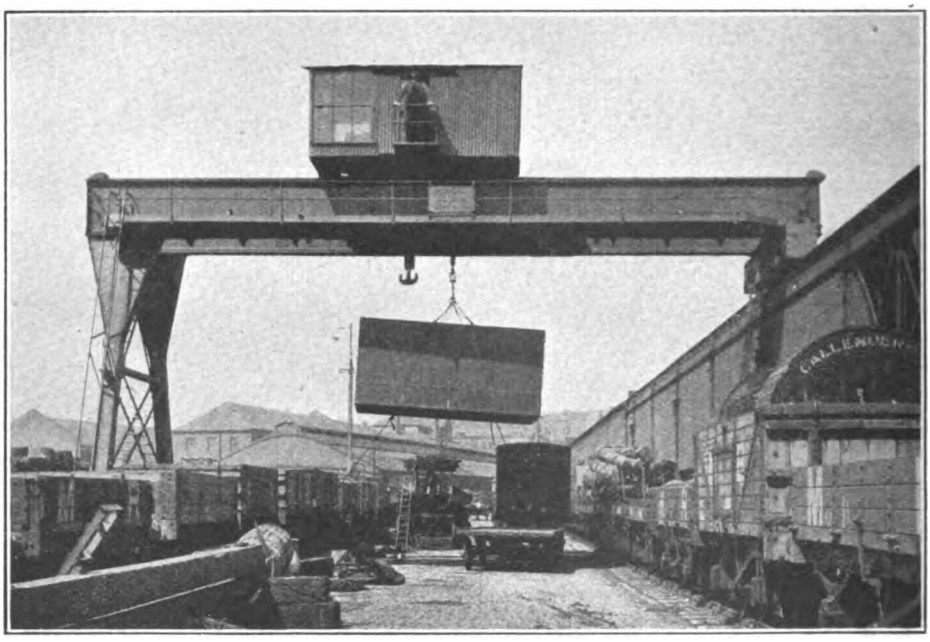
standing on the tracks below, others the roadways between the platforms, and others again the platforms themselves, each space or level being served at specified points by separate traversers. The transporters have a speed on a full load of 100 ft. per min., and 200 ft. per min. on light load, the travelling speed being 350 ft. per min. A point that should be mentioned is that all the electric overhead cranes can, if desired, be concentrated in line.

Supplementary to the eight transporters are six jiggers, these latter being fitted on the topmost floor and arranged on beams to travel a distance of from 12 ft. to 15 ft., just sufficient to cover the wells or openings serving the outer roadway on each side of the station. These jiggers, in other words, constitute light overhead electric lifts. Three of them are placed on either side of the building, which avoids traffic congestion at the loading platform. They are operated by means of controllers fixed on the floor and worked therefrom.

Capstans are distributed throughout the ground floor. They are operated by the station staff by means of foot plungers, the plungers being designed to give a variation of speed. In addition to this plant, there are 11 electric hoists supplied by Cowans, Sheldon and Co., Limited, of Carlisle, with lever control, and capable of lifting 1½ tons. These are worked by youths specially appointed for the purpose. The current supply for the equipment is brought in from the Glasgow Corporation.

High Street goods station is the largest of its kind owned by the North British Railway Company, and there the greatest volume of sundries traffic is handled. In addition to the sundry traffic, there is also a large vegetable traffic, the vegetables being drawn chiefly from the East of Scotland. In pre-war times there was also a large Continental fruit traffic, which was shipped to Leith and Grangemouth, and railed from those ports to High Street. The station being adjacent to the fruit bazaar and vegetable market, offers exceptional facilities for the prompt handling of such traffic.



GOLIATH CRANE MAKING A LIFT.

In respect of traffic despatched from the station, it includes a large proportion of American and Canadian produce shipped to Glasgow, which is distributed throughout Scotland and the North of England.

The traffic dealt with at the station also includes heavy consignments of

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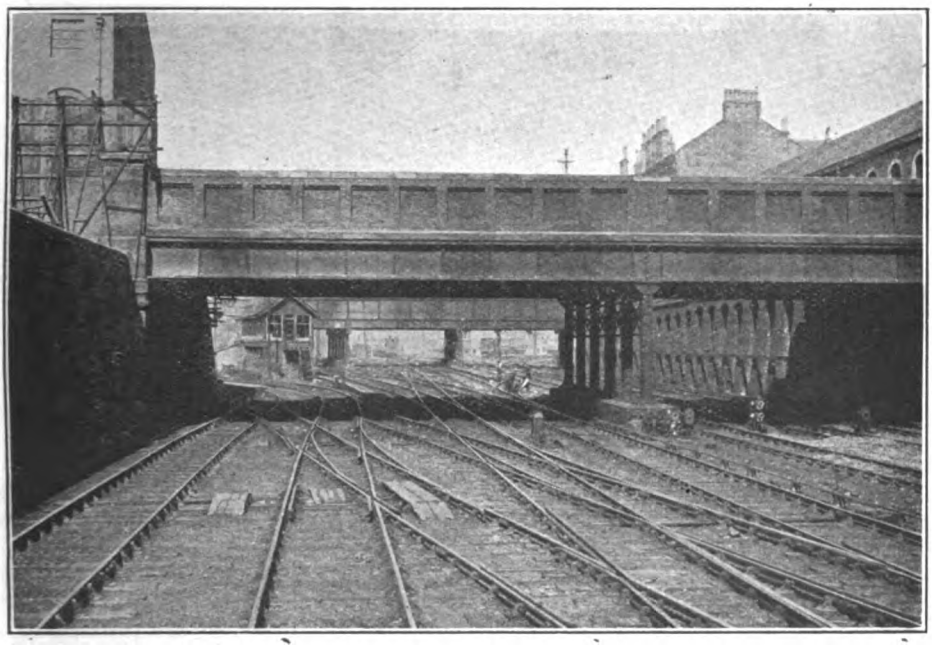
wholesale drapery, furnishing ironmongery and other similar goods; in fact, all classes of goods are included in the very large amount of miscellaneous traffic operated at the station. The greater part of the inward traffic is for town delivery, a small portion being put into store, as already pointed out, there being extensive warehousing accommodation available at the station. There is also a considerable transhipment traffic dealt with. The latter is of a general kind, destined for places in the western islands of Scotland, Ireland and American ports.

yard there is a large potato shed, and here potatoes from all parts of the North British Railway system are received and distributed.

Horse drays are principally employed at High Street station, but there are also motor lorries engaged, working to and from the station.

Our thanks are due to Mr. John C. Christie, Chief Goods Manager, North British Railway, for facilities granted on the occasion of our visit to High Street station, in obtaining information relative to the buildings and their equipment, the yards and the methods of handling



EAST JUNCTION, SHOWING LAY-OUT ARRANGED FOR INTERCHANGE WITH G. & S.W.R.

It has already been stated that upwards of 800 loaded wagons are moved daily at High Street, exclusive of exchange and coal traffic. The latter is dealt with at the Barracks depôt near by, where also castings and root vegetable traffic is provided for. At the east end of the

the traffic. We are further indebted to Mr. Christie for the originals of the photographs reproduced herewith. Our thanks are likewise due to Mr. W. Wood, Electrical and Telegraph Superintendent, for particulars relating to the overhead cranes and other electrical equipment.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.
A.M.Inst. T.

Photo.] [*E. A. Gurney-Smith.*

HIGHLAND RAILWAY.
4-4-0 express engine, No. 74, "Durn."

THERE has been more of distinction about the locomotive building of 1920 than about that of 1919. In the latter year, the primary consideration was that of making up—or attempting to make up—the arrears of construction caused by war conditions, and on that account the vast majority of locomotives built for British railways in 1919 were of types already existing. But in 1920 there has been more time and opportunity for new ideas to take shape, with the result that up to the time of writing—the latter end of November—seven new locomotive types have made their appearance during the year. Of these probably three only, or at most four, could be considered as entirely new, the remainder being developments of existing classes in each case.

The three engines in question are Sir Henry Fowler's 10-coupled banking engine for working the Lickey incline on the Midland Railway; Mr. J. L. Crosthwait's exceedingly fine 4-6-4 tank engines for the Belfast and County Down Railway of Ireland; and Mr. C. Jones' 4-4-4 tank design for the Metropolitan Railway. All these engines have been illustrated and fully described in the past year's issues of the RAILWAY MAGAZINE, and need little further comment. To the Midland engine I referred in detail in the May number of 1920. The Belfast and County Down locomotive is notable principally on account of the comparatively light weight in working order of a machine of such size and power—81½ tons—the "Charles C. Macrae" class on the Brighton for example, weighing 98 tons each, with the same arrangement of wheels. The latter are, however, considerably more powerful engines. It is rather surprising—indeed, almost unique—to note the reversion on the Metropolitan Railway from six-coupled to four-coupled engines for suburban service, especially in view of the heavy gradients to be surmounted on the Aylesbury route, and the tight timing of the trains, but doubtless the new engines, with their ample dimensions, including an adhesion weight of 39 tons, will give a good account of themselves. So far as external appearance goes, it is a pity that it should have been found necessary to raise the running plate so high above the piston valve chests, as this feature, with its consequent exposure of all the motion, detracts from what would otherwise be a very handsome outline.

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As regards the fourth of the seven classes mentioned in the last paragraph—Mr. H. N. Gresley's three-cylinder 2-6-0 No. 1000 on the Great Northern Railway—this is really a development of the previous "Moguls," although the novelty of the cylinder arrangement and of the 6-ft. boiler probably entitle it to be considered as an entirely new type. Further engines of this class are now building at Doncaster. The 1270-1274 series of superheated 0-6-0's on the Great Eastern Railway, of Mr. A. J. Hill's design, although developments of the "F48" type, also embody some exceptional features. Amongst these is a wheelbase of 18 ft. 10 in., which is probably unique for a 0-6-0 engine, and I should imagine that it also is unique for the standard boiler of a 4-6-0 type of express engine to be mounted on six wheels, as has been done in this case. The new "1270's" thus conform to the "1500" class express engines in regard to both boiler and cylinders, the latter being of 20 in. diam. and 28-in. stroke. These 0-6-0's are easily the most powerful engines of this wheel arrangement in the country; their normal tractive effort, at 85 per cent. working pressure, is no less than 29,000 lb. The remaining two novelties are Sir Vincent Raven's three-cylinder variant of the various "S" classes of mixed traffic 4-6-0's on the North Eastern Railway, known as class "S3," of which remarkably good-looking type ten engines have been built up to the present; and Mr. R. W. Urie's long-promised 5 ft. 7 in. mixed traffic engines on the London and South Western Railway, which are simply a small-wheeled version of his most successful 6 ft. 7 in. 4-6-0 "736" class.

To existing classes considerable additions have been made on a number of lines. On the London and North Western Railway 30 "Claughtons" have been turned out at Crewe, in addition to 15 "Prince of Wales" 4-6-0's, bringing the former class up to 90, and the latter up to 155 engines. In addition to the three-cylinder 4-6-0 engines mentioned, the North Eastern Railway has been turning out new three-cylinder 4-4-4 tank engines of the "D" class, which, sad to relate, are taking the numbers of the "J" class single-drivers now in course of being scrapped. I well remember my last trip with one of the latter engines, on the summer Leeds-Scarborough "non-stop," when No. 1523 distinguished herself by reaching 85 m.p.h. on Micklefield bank, and by attaining no less than 76½ on the level near Ganton. Armstrong, Whit-

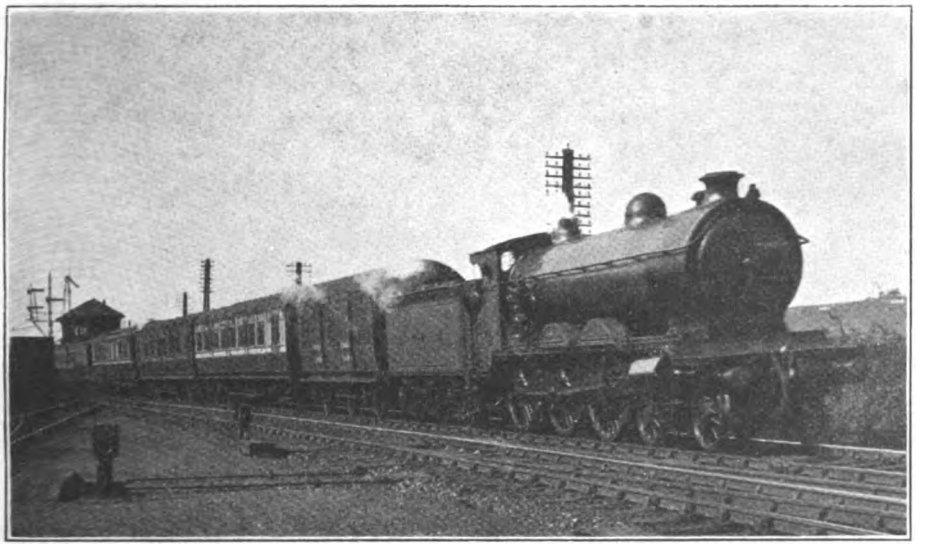

Photo.] CALEDONIAN RAILWAY. [*F. E. Mackay.*

Glasgow–Liverpool express approaching Carlisle. Pickersgill 4-6-0 superheater engine, No. 62.

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worth and Co., have also been supplying "T2" class 0-8-0 mineral engines, and small 0-6-0 shunting tanks. On the Great Eastern Railway 10 more 4-6-0 express engines—Nos. 1561-1570—have been built at Stratford, which, when Messrs. Beardmore have supplied the whole of their 1541-1560 batch, will complete a series of 70 engines. North British building comprises five 0-6-0 goods engines, 10 0-6-2 tanks, and 12 4-4-0 superheater engines of the "Glen" class; the Great Central Railway has added five 4-4-0 express engines of the "Director" type, and is now turning out additional four-cylinder 4-6-0 locomotives similar in all respects to "Lord Faringdon" save for the provision of a larger cab with side windows. On the Great Northern Railway 15 further superheated 0-6-0 tender engines complete a series of 110 of this type—521-630.

Beyond the orders with outside builders already mentioned, several British companies have made other very large contracts. The London and North Western Railway is reported to have placed 90 "Prince of Wales" class 4-6-0's with Beardmore's; the Great Northern Railway has an order for 25 "Moguls" with Kitson's, of Leeds, and 60 further engines, comprising 50 superheated 0-6-2 tanks and 10 3-cylinder 2-8-0 mineral engines, with the North British Locomotive Company; while even the Great Western Railway has been compelled by pressure of constructional work to divert from Swindon to Robert Stephenson and Co., of Darlington, an order for 50 2-6-0 engines. To the North British Locomotive Company goes an order from the North British Railway for 15 0-6-0 goods engines, six 4-4-2 tanks, and two "Atlantic" express engines, while a Great Central order for 20 4-6-0 locomotives is divided between the Vulcan Foundry and Beyer, Peacock and Co.— 10 apiece.

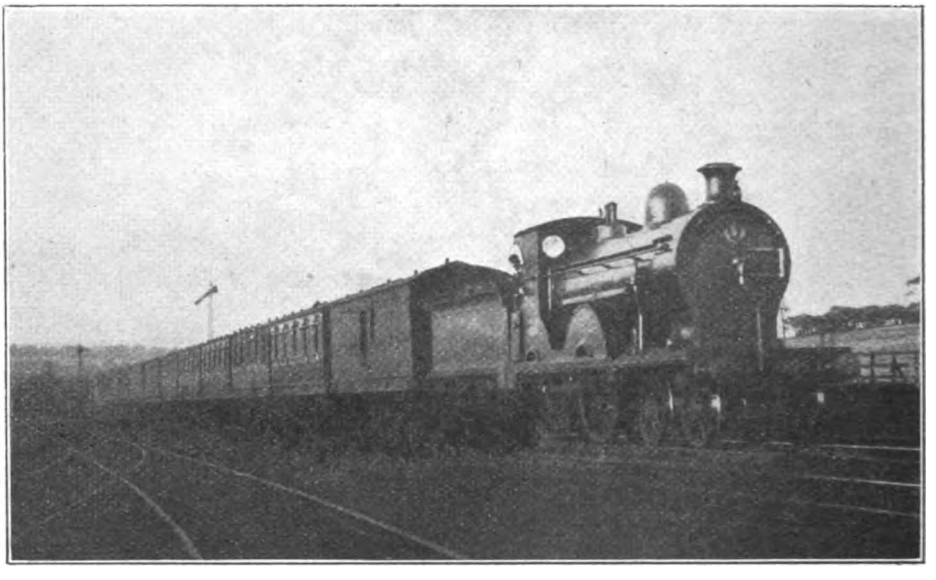

Photo.] GLASGOW & SOUTH WESTERN RAILWAY. [*E. A. Gurney-Smith.*

Train from Darvel approaching Galston.

Among rebuildings of the past year, extensive progress has been made on the London & North Western Railway in the conversion both of the Webb four-cylinder 4-4-0 compounds to simples of the "Renown" class, and of the compound 0-8-0 coal engines to superheated simples. The rebuilding of the Wainwright 4-4-0's on the South Eastern & Chatham Railway by Mr. Maunsell as superheater engines is also proceeding rapidly, much of this work being in the hands of outside builders. Interesting rebuilds by Mr. Whitelegg of 4-4-0 and 4-6-0 locomotives on the Glasgow & South Western Railway were described in a recent issue of the

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RAILWAY MAGAZINE. Perhaps the most notable of the 1920 conversions has been that of the Great Northern Doncaster compound "Atlantic" No. 1421 to a superheated simple engine of exactly the same external appearance as the ordinary 251's; thus the Great Northern Railway is now left with only one compound locomotive—No. 292—as No. 1300, the Vulcan Foundry compound, was converted to a simple engine a couple of years ago. So much for locomotive developments.

Time-table changes have been dealt with in these articles as they have taken effect, with the exception of those on the Great Northern and North Eastern Railways dating from the beginning of November last, although actually coming into force on the 8th of that month, at the conclusion of the coal strike. The principal novelty is the diversion of the mid-day express from Harrogate to London *via* Leeds, the train running *via* Arthington as far as Geldard Junction, and from there running round the connecting curve up into the Leeds Central Station. Leaving Leeds at 12 noon, it becomes a 4 hr. 10 min. train to London, due in King's Cross at 4.10 p.m. The extraordinary experiment made with the 5.30 p.m. down Newcastle express is also wiped out by the restoration of that train to its pre-war working, in all respects but the timing and the Durham stop; at York, also, passengers are set down only. Between York and Darlington the 47 min. booking previously in force from Clifton Junction is retained, the full distance of 44·1 miles now involving an average speed of 56·3 m.p.h.—no mean figure with a 10-coach load of 300 tare tons, and a sharply curved start and very slow finish. York and Middlesbrough passengers are now carried on the 5.30 p.m. down, the 6.5 p.m. from King's Cross being cancelled and the Hull portion attached to the 5.40 p.m. down Leeds, which thus becomes a colossal train of 400 tons tare weight—very similar, indeed, to the 4 p.m. down to Leeds, which generally turns the scale at about the same figure. Some relief is certainly needed at this time in the afternoon and evening, and it has occurred to me that if the 4 p.m. down were divided into its original pre-war portions—at 3.25 for York and 4 p.m. for Leeds—and the Leeds portion accelerated to a reasonably fast schedule, it would probably divert traffic from the 5.40 p.m. down, and thus help to equalise the loading of the three trains. Otherwise a train might still be run at 6.5 p.m. with through coaches for Boston and Grimsby, Lincoln

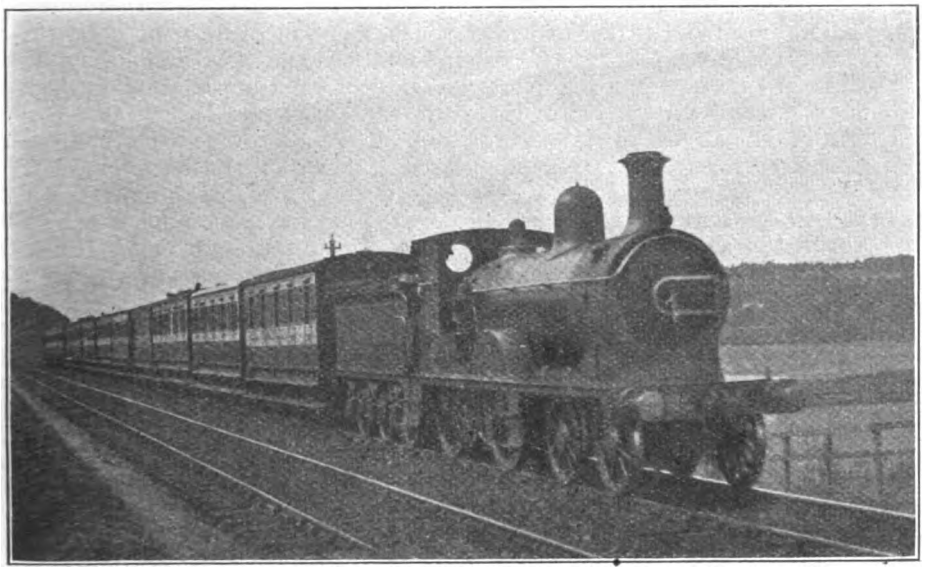

Photo.] GREAT NORTH OF SCOTLAND RAILWAY [*E. A. Gurney-Smith.*

Elgin-Aberdeen express passing Pitmedden. 4-4-0 locomotive, No. 14.

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and Hull, which would relieve the 5.40 of a good proportion of its present custom.

So far as Leeds and the West Riding generally are concerned, indeed, why should not the Great Northern Railway copy the Midland Manchester service by arranging the trains at even two-hour intervals? Supposing, for example, that the down expresses left King's Cross at 8.15 and 10.15 a.m.; 12.15, 2.15, 4.15 and 6.15 p.m.; the 12.15 p.m. would be the down working of the present 1.40 p.m. down to Harrogate, while the other trains mentioned would take the place of the existing 7.30 and 10.10 a.m., 1.30, 4 and 5.40 p.m. down expresses. This would not only serve better to distribute the trains to important intermediate points on the Great Northern main line, replacing such "bunches" of trains as those at 1.20, 1.30 and 1.40 p.m., but would "dovetail" well with the present best Midland trains from St. Pancras to Leeds, at 9 and 11.45 a.m., 3.20 and 5 p.m. Many similar arrangements of a desirable nature occur to one's mind. Why not 9 and 11 a.m., 1, 3, 5 and 7 p.m. from Euston to Birmingham, instead of 9, 11.30, 1.50, 4.30 and 6.50 p.m., the 3 p.m. only being additional to the present service? This would leave to the Great Western Railway the intermediate hours of 10 a.m., 12 noon (this time might not be required), 2, 4 and 6 p.m., instead of 10.15 a.m., 2, 3.25 and 5.30 p.m., and would afford exactly an hourly service between London and Birmingham, without any overlapping of the two routes, or material alteration of present times. Again, 9.45 a.m., 11.45, 1.45, 3.45 and 5.45 p.m. from Euston to Liverpool seem a more systematic and surely as equally feasible a series of times as 10.10 and 11.45 a.m., 2.25, 3.45 and 5.20 p.m.? One sometimes wishes that the time-table departments of our great railways could take a broader view of things; the post-war reconstruction of time-tables offered an unrivalled opportunity of constituting main-line train services on a more scientific and less haphazard basis than heretofore, and especially of fitting the times of the trains over competing routes in such a way as to afford the maximum facilities to the travelling public at the least cost of operation. But train times to-day in most directions seem more haphazard than ever.

To return to the East Coast alterations, although the 5.30 p.m. down is only slowed 6 min. by the insertion of a passenger stop at York, and still reaches Newcastle in 5 hr. 41 min., the corresponding up train, at 8 a.m. from Newcastle, is decelerated to an overall time of 6 hr. 20 min.—only 5 min. better than its worst war schedule, and 50 min. behind pre-war running. It was already much overtimed, and yet a further 10 min. has been added in virtue of a regular instead of a conditional stop at Northallerton, a passenger instead of a locomotive stop at York, and an additional stop at Grantham. On a day during the recent coal strike, without exceptional running (save on the North Eastern Railway, of which more in a moment), we cut the present schedule by 26 min., after allowing for loss of time by delays, and the extra stop at Doncaster. Deducting the 9-min. stop at Peterborough—surely no longer needed now that Eastern Counties passengers can travel direct from York by the Great Eastern 10.25 a.m. luncheon car express—and the 6-min. halt at Northallerton, worth between them fully 20 min., and neither in force before the war, our running on this occasion was virtually at pre-war level. In these circumstances can it really be necessary to add as much as 50 min. for the present running to the pre-war time? One can hardly think so. Concurrently with the alteration to this train, the Hull and Middlesbrough express due in King's Cross at 1.35 p.m. is withdrawn, Middlesbrough passengers joining the Newcastle express at Northallerton, and reaching London 45 min. later, while the Hull portion is attached at Doncaster to the 9.35 a.m. from Leeds to London, due at 1.55 p.m., 20 min. later than heretofore.

One more grumble before I pass on to performance. It is rather a serious thing that no mention of the important alterations just referred to appeared in the November issue of "Bradshaw." They were published in the *Railway Gazette* for the last week in October, so that information concerning them evidently was forthcoming well before the date that "Bradshaw" was published. Even if the notice of the alterations was received too late for insertion in the text, there was still time for the preparation of a leaflet to accompany the issue, giving details

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of the changes. Of all publications, "Bradshaw" is surely the one that can least afford to make errors or omissions. Errors in newspapers or magazines, regrettable though they may be, are not so likely to involve any one in inconvenience. But imagine a traveller to Middlesbrough on any date in November, after consulting "Bradshaw" and finding there was a through express at 6.5 p.m., turning up at King's Cross at a quarter to six to find that the last train left at 5.30 p.m.! Of all the various railway guides, "Bradshaw" is, I believe, the only one to claim "official" authority, so that omissions of this kind, whether the onus of responsibility for them rests upon the publishers or upon the railway companies concerned, are the more inexcusable. Neither is this an isolated instance, as in the previous month—October—no mention was made of the additional trips and the acceleration of the "Southern Belle" expresses on the London, Brighton and South Coast Railway.

The North Eastern run on the 8 a.m. from Newcastle to London, to which I referred in the last paragraph, was, south of Darlington, a remarkable effort. No. 2165—"Z" class three-cylinder "Atlantic"—was the engine, with a 44-axle load (11 vehicles) weighing 310 tons empty, and 330 tons full. We passed Croft Spa, 2·6 miles, in 5 min. exactly, and negotiated the 1 in 366 ascent thence to Eryholme at a minimum of 53 m.p.h., passing the latter junction, 5·2 miles, in 8 min. 5 sec. On the faintly falling grades thence we reached 67 m.p.h., passing Danby Wiske, 10·4 miles, in 13 min. 10 sec., and stopping at Northallerton, after a very careful approach, 14·1 miles, in 17 min. 25 sec. Restarting from Northallerton, we passed Thirsk, 7·8 miles, in 9 min. 55 sec., having by then attained 65 m.p.h., and subsequently worked up on a practically level track to 69 m.p.h. at Pilmoor, passed in 15 min. 35 sec. (13·9 miles), and no less than 72½ m.p.h., sustained for some distance, at Alne, which we passed in 19 min. 40 sec. (18·8 miles). After this the engine was eased somewhat, but we got through Beningbrough, 24·5 miles, in 24 min. 55 sec., and Poppleton Junction, 28·4 miles, in 28 min. 35 sec., or all but "even time." The 25 level miles from Otterington to Poppleton Junction were, in fact, run in 22 min. 55 sec., and the 16·7 miles from Thirsk to Beningbrough in exactly 15 min., at an average of 66·8 m.p.h. in the latter case. There were slight delays outside

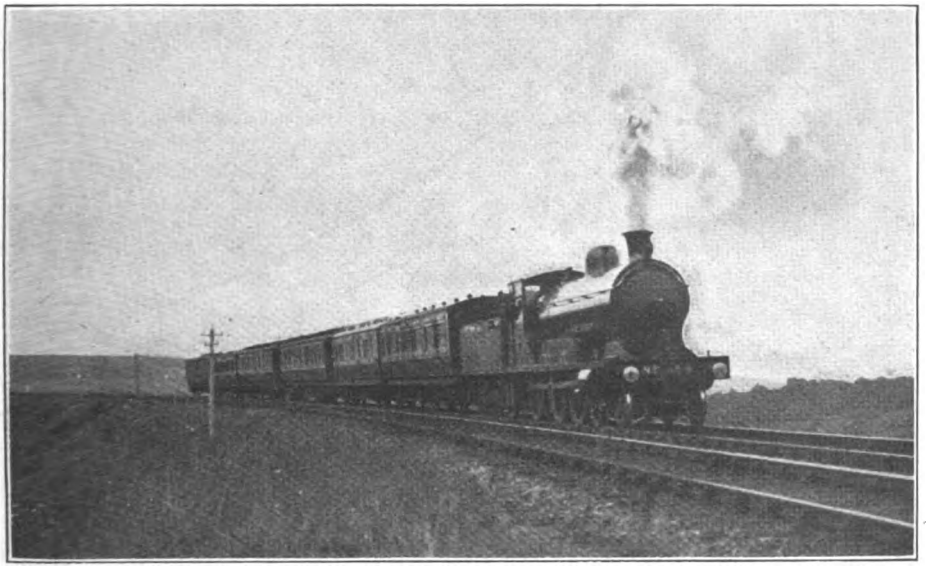

Photo.] **HIGHLAND RAILWAY.** [*E. A. Gurney-Smith.*

Inverness–Euston West Coast Sleeping-car express crossing Culloden Moor. 4-6-0 locomotive, No. 158, "Darnaway Castle."

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York, but we covered the 30 miles from Northallerton to York start-to-stop in 32 min. 50 sec., or 31½ min. net. On present timings, therefore, the engine gained half-a-minute to Northallerton, and 4½ min. net beyond—total 5 min. Without the Northallerton stop our 44.1 miles' journey from Darlington would not have taken more than 45½ min.

As this is an issue largely of Scottish interest, we will now proceed north of the Border, and may as well do so by means of a run which I enjoyed last summer on the first portion of the down day "Scotsman" between Newcastle and Edinburgh, notable mainly on account of the load, which totalled 56 axles (6 "twelves" and 5 "eights"), and weighed 353 tons empty, and 370 tons full, the passenger complement being small. Three-cylinder 4-4-2 No. 737 was the engine. In the early stages of the run we were delayed by a cross-over slack to 15 m.p.h. north of Heaton, and so took 18 min. 55 sec. to surmount the 9·9 rising miles to Cramlington, 4¼ of which are at 1 in 200-224, but with a maximum of 64 m.p.h. beyond Plessey we passed Morpeth, 16·6 miles, in 26 min. 20 sec., at the customary reduced speed.

The next 18·2 undulating miles to Alnmouth were covered in good style in 19 min. 50 sec., speed being also reduced to 50 m.p.h. through the latter station, as is now customary. This reduction hinders the ascent at Longhoughton bank, but we did not fall below 32½ m.p.h. on the 3¾ miles at 1 in 170, the 8·2 miles from Alnmouth to Christon Bank taking 11½ min.; after this we went under very easy steam, not exceeding 65 m.p.h. on Christon Bank itself, and taking 8 min. 55 sec. for the 8·6 miles thence to Belford, 9 min. 40 sec. for the 9·2 miles on to Goswick, and 9 min. 40 sec. again for the final 6·1 miles up into Berwick, which we passed at 15 m.p.h. in 85 min. 55 sec. from Newcastle.

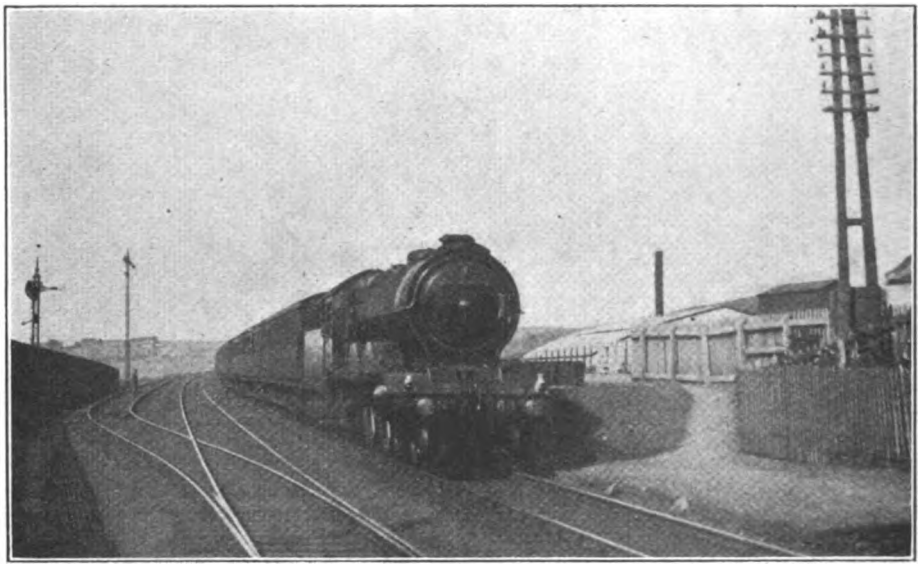

Photo.] NORTH BRITISH RAILWAY. [*E. A. Gurney-Smith*

Aberdeen-Edinburgh express passing Newtonhill. 4-4-2 engine, No. 868, "Aberdonian."

From Berwick there are 4½ miles up, nominally at 1 in 190, but in part as steep as 1 in 150; we worked up to and maintained 27 m.p.h. on the latter grade, passing Burnmouth, 5·5 miles from Berwick, in 12¼ min. On the 3½ miles of easy or falling grades from Burnmouth we reached 57½ m.p.h., and Grant's House bank, 8¼ miles long (including nearly 6 at 1 in 200) did not bring us below 32 m.p.h. The 5·7 miles from Burnmouth to Reston Junction took 7 min., and the 5 miles thence to Grant's House, 7 min. 50 sec.; after that we went most gently

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down Cockburnspath bank, speed nowhere exceeding 66 m.p.h., so that the 12 miles from Grant's House to Dunbar took 12 min. 55 sec. After that the 11·5 miles on to Drem occupied 12 min. 50 sec., the 4·7 miles from there to Longniddry 5¾ min., and the 6·8 miles thence to Inveresk 8 min. 10 sec.; but delays through Portobello caused the last 6·5 miles into Edinburgh to take 11¼ instead of the 10 min. allowed. Total time for the 124·4 miles from Newcastle was therefore 163 min. 50 sec., and net time, allowing for both Heaton and Portobello delays, about 160½ min. Some of my younger friends might have thought this a wonderful achievement, seeing that the public time-table showed this train as leaving Newcastle at 3.53 p.m. and reaching Waverley at 6.50 p.m.—177 min.—but in point of fact our gain on schedule was not 16½ min. net, but 4½ min. merely, as the *working* time of arrival was 6.38 p.m. It seems to me unnecessary and, indeed, very misleading to the public thus to show a difference of no less than 12 min. between working and public times, merely to preserve the fiction of no running time less than 9 hours between London and Edinburgh or Glasgow.

My North British runs were confined to three on 60-min. trains between Edinburgh and Glasgow, and were hardly up to the level of previous experiences over this route. Of these trips one on the 7.15 p.m. *ex*-Waverley was probably the best, the engine being a non-superheated 4-4-0 of the "Scott" class—No. 339, *Ivanhoe*—with a 41-axle train weighing 287 tons tare and about 305 tons full. It was evident from the sound of the exhaust that the engine was being worked fairly hard all the way. We passed Haymarket, 1·2 miles, in 3 min. 35 sec.;[1] Ratho, 8·2 miles, in 12 min. 50 sec.; Winchburgh Junction, 12·6 miles, in 17 min. 55 sec.; Linlithgow, 17·6 miles, in 23 min. 35 sec.; Polmont, 22·3 miles, in 28½ min.; Greenhill Upper Junction, 30 miles, in 37 min. 5 sec.; Lenzie, 41 miles, in 49 min. 25 sec.; and Cowlairs, 45·8 miles, in 55 min. 20 sec. Here speed was reduced with extreme caution at the top of the bank to 10 m.p.h.; and continuing very slowly we ran into Queen Street, 47·3 miles, in 60 min. 20 sec. Speed was maintained at 51½ m.p.h. on the 12 miles of faint ascent at 1 in 960 past Winchburgh, and rose to 60 at Manuel, falling again to 52½ m.p.h. on the 1 in 857 to Falkirk Tunnel. The route is thus practically level, save for the 1 in 45 of Cowlairs Bank.

A journey on the "Lothian Coast Express," behind superheated 4-4-0 No. 428, *Adam Woodcock*, was of little interest, the load being only 230 tons gross. This train, by the way, was brought from North Berwick into Edinburgh by a superheated 4-4-2 tank. We passed Haymarket in 3 min. 50 sec., and were then slacked to cross over to the west lines; thus the time to Ratho was 13¼ min. But little attempt was made to regain the loss, the running in parts being slower than on the preceding trip. We took 23 min. 40 sec. to Linlithgow, 28 min. 55 sec. to Polmont, 37 min. 50 sec. to Greenhill Upper Junction, 49 min. 55 sec. to Lenzie, and 60 min. 25 sec., or 59 min. net, into Glasgow. A return journey on the 8.55 p.m. *ex*-Queen Street, with 300 tons and No. 416, *Ellangowan*, was equally dull. Banked in rear by 0-6-2 tank No. 282 to Cowlairs, which we passed in 5¾ min., we took 13 min. 20 sec. to Lenzie, and 31¾ min. to Falkirk, 21·8 miles; after that we were badly delayed by signals before Polmont, and so took 42 min. 10 sec. to Linlithgow, 53 min. 5 sec. to Ratho, 60 min. 20 sec. to Haymarket, and 63 min. 40 sec. to Waverley, no attempt at all having been made to recover the lost time. Indeed, net time was not less than 61½ min. The highest speed reached was 60 m.p.h., at Ratho.

On the Caledonian Railway I have made my first trip behind one of Mr. Pickersgill's outside cylinder 4-6-0's of the "60" class, although here again the running, while quite good, was in no way exceptional. No. 61 was the engine, and we left Glasgow on the 3.50 p.m. express with a 59-axle train, weighing 356 tons empty, and 380 tons full. With this heavy load we ran the 12·8 miles to Motherwell in 21¾ min., although it includes 5 miles up at 1 in 107-135. We passed Uddingston, 8·5 miles, in 13 min. 55 sec. At Motherwell we dropped the Lanark portion, and thus became a 38-axle train of 260 tons gross. Maintaining 29 m.p.h. on the 1 in 99 before Law Junction—the steepest part of the 11 miles at 1 in 99—137 which extends from Motherwell to Craigenhill Summit—we passed Law Junction, 5·4 miles, in 11 min. 50 sec., and Cleghorn, 13·2

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miles, in 25 min. 25 sec., Carstairs, 16 miles, being reached in 29¾ min. Each of the first two stages had therefore been run in ¼ min. under schedule. At Carstairs, owing to a mishap to the Edinburgh portion, we were kept waiting 31 min., instead of 10, and I had hopes of some attempt to regain the arrears, but no such attempt was made.

Our train now totalled 54 axles, and weighed in all 380 tons, and the work with such a load up to Beattock Summit was the best of the trip. We first covered the 6·6 miles to Symington, including 2 miles up at 1 in 150 and 1½ at 100, in 11 min. 35 sec., start-to-stop, a very fair piece of work. Re-starting, we passed Lamington, 3·7 miles (mostly of favourable grades), in 6 min. 25 sec., crossing the Clyde at 56½ m.p.h.; the 5·4 miles of easy ascent thence to Abington took 6 min. 50 sec., the 5·2 steeper miles on to Elvanfoot (culminating in 1½ at 1 in 142-152), 7 min. 50 sec., while the last 2·9 miles up to Summit, of which 2¼ are at 1 in 99, and on which speed fell to 26 m.p.h., occupied 5 min. 10 sec.—total 26¼ min., instead of the 27 allowed, for the 17·2 miles up from Symington. But very slow running down Beattock bank nullified some of this advantage, as the 10 miles to the stop at Beattock took 11 min. 35 sec., and made our start-to-stop time from Symington 37 min. 50 sec., allowed 38 min. A rather poor start was made from Beattock, as we did not exceed 62½ m.p.h. on the initial 4½ miles at 1 in 202 down, and so took 7 min. 5 sec. to Wamphray, 5·2 miles, and 17 min. exactly to Lockerbie stop, 13 miles, allowed 16 min. On the concluding 25·8 miles' run to Carlisle also we barely held our own, taking 10 sec. over the 32 min. allowed, and not exceeding 64 m.p.h. at Kirtlebridge and 60 on Kirkpatrick bank. Ecclefechan, 5·7 miles, was passed in 9 min. 40 sec., Kirtlebridge, 9·1 miles, in 13 min. 5 sec., and Gretna, 17·2 miles, in 21½ min; we reached Carlisle 20 min. late. Possibly the loss of my connection at Carlisle jaundiced my view of the performance; certainly I found it disappointing in the circumstances.

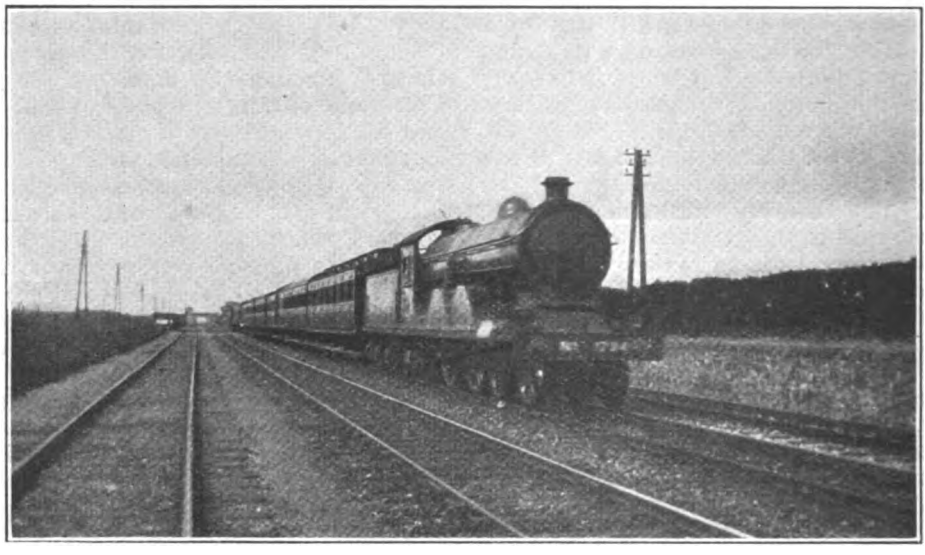

Photo.] **EAST COAST ROUTE.** [*P. Maxwell-Wood.*

Edinburgh–King's Cross express near Drem Junction, North British Railway.
4-4-2 North Eastern Railway engine, No. 1794, Class "V" (superheated).

Some more interesting running occurred one night on the 9.45 p.m. express from Glasgow to London when I was aboard. This was made up to 56 axles of the heaviest stock, weighing 385 tons empty, and 400 tons with passengers and luggage. No. 137, a non-superheated McIntosh 4-4-0, was the engine, piloted to Beattock

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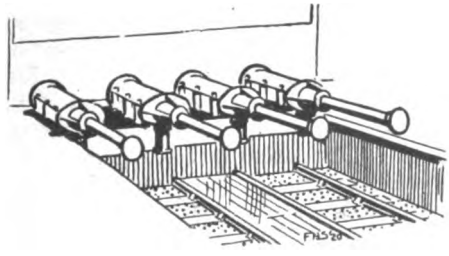
Summit by No. 902 of the same type. We passed Uddingston in 12 min. 35 sec., but were practically stopped near Fallside, owing to a rumour of sheep on the line. So it took us 23 min. 5 sec. to pass Motherwell, but between there and Summit we gained no less than 16 min. on schedule, as we passed Law Junction in 33 min. 5 sec. (maintaining 29½ m.p.h. on the 1 in 99), Carstairs in 51 min., Symington in 60 min. 55 sec., Lamington in 65 min. 20 sec., at 59 m.p.h., and Elvanfoot in 78 min. 35 sec., speed having been maintained at 40 m.p.h. on the short preceding 1 in 142 ascent. So we reached Summit, 52·6 miles, in 83 min. 5 sec., or 80 min. net, instead of the 97 min. scheduled; we had, however, started 5 min. late, and the booked time mentioned includes a 2-min. locomotive stop at Carstairs when required. After a halt of 3½ min. to detach the pilot, we re-started, still 5½ min. early, and did some unusual speed down the bank, with a maximum of 76½ m.p.h.; we passed Beattock, 10 miles, in 11 min. 50 sec., Wamphray, 15·2 miles, in 16 min. 20 sec., and Lockerbie, 23·8 miles, in 26¼ min., now 6¼ min. early; then came delays, so that our total time into Carlisle was 153 min. 5 sec., instead of the 155 min. allowed. But the net running time for the journey was between 16 and 17 min. inside schedule—an enterprising feat, even allowing for the exceptionally easy character of the timing.

In the opposite direction a trip on the 6.50 p.m. express from Carlisle to Glasgow had some interesting features. The load was 245 tons, and out of Carlisle we were horsed by No. 906, a McIntosh 4-6-0, now superheated. Right at the start we had a bad signal check, and so took 14 min. 10 sec. to Gretna, 8·6 miles; up the 7½ miles at 1 in 193-200 of Kirkpatrick bank our minimum rate was 40 m.p.h., and the second 4¼ miles at the same inclination past Ecclefechan brought us down to 49, the intervening maximum being 56½ m.p.h. We had touched 60 m.p.h. before Gretna, and did so again before stopping at Lockerbie; we reached the latter place, 25·8 miles, in 36 min. 50 sec., or 33 min. net (as scheduled), after having passed Kirtlebridge, 16·7 miles in 25 min. 50 sec. From Lockerbie the allowance of only 18 min. for the 13·8 miles to Beattock is none too easy, but we only lost 5 sec. on schedule, passing Wamphray, 8·7 miles, in 11 min. 20 sec.

At Beattock we changed our 4-6-0 for a superheated "Dunalastair II"—No. 766—and, banked in rear as usual, mounted the 10 miles at 1 in 69-88 to Summit in the good time of 20 min. exactly, or 4 min. under schedule, speed varying on the climb from 32 to 34 m.p.h. From the Summit we covered the 17·2 miles to Symington in 20 min. 10 sec., without exceeding 60 m.p.h., the complete 27·2 miles from Beattock having taken 40 min. 10 sec., instead of 44 min. allowed. From Symington we covered the 6·6 miles to Carstairs, start-to-stop, in 10 min. 10 sec., or 9¾ min. net, and from Carstairs to Motherwell the 16 miles took 24 min. 5 sec., allowed 26 min. There were signal delays on the concluding stretch, but 7 min. of lost time had been regained between leaving Beattock and Motherwell respectively, at least 6 of which could be credited to No 766. Some further runs, of which I have received details from correspondents, especially some on the Glasgow & South Western Railway, must be deferred for consideration on a future occasion.



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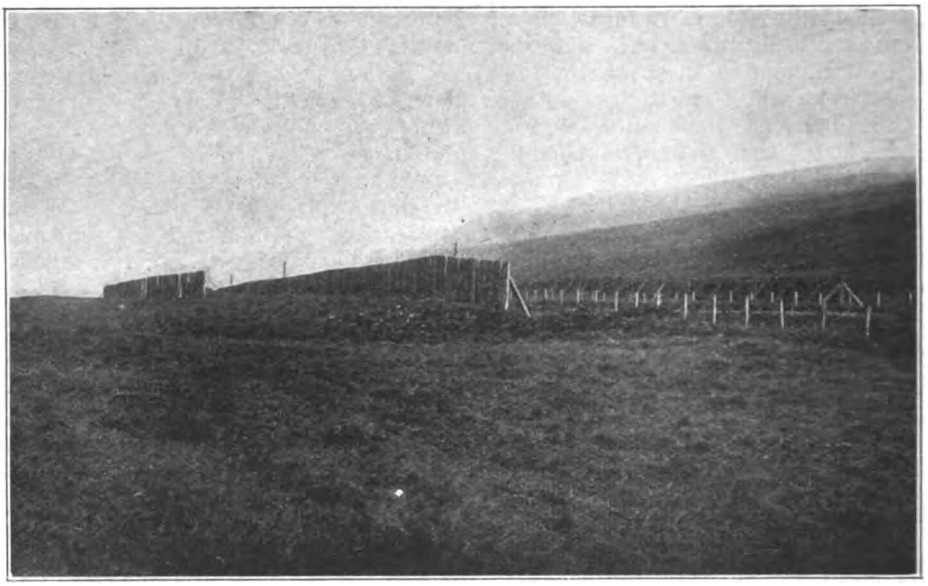

SNOW FENCES PROTECTING THE HIGHLAND RAILWAY WHERE IT CROSSES THE GRAMPIAN MOUNTAINS NEAR DALWHINNIE STATION.

Fighting the Snow on Britain's Farthest North Railway.

EXTENDING well into the 59th parallel and penetrating into the latitude of Labrador and Petrograd, and maintaining an altitude over the thousand-foot level for more than fifty miles where it crosses the Grampian Mountains, the Highland Railway during the winter and spring months is exposed to greater extremes of climate than any other railway in Britain.

Whilst Alpine and Ski-ing Clubs are watching with eager anticipation for reports of snow falls on the Grampian and Cairngorm Mountain Ranges, those who are entrusted with the duty of maintaining regular railway services over the same territory may be overtaken with a fever of anxiety. The actual depth of the snow fall though it may be 12 inches, more or less, is not in itself of any consequence, but when the storm-fiend rouses himself and that same snow is caught up in a blizzard of wind and driven for miles across the treeless moorlands of the Highlands, the danger point is reached and the time for action has come. The telegraph wires soon begin to hum with orders from Headquarters for the mounting of snow ploughs on trains, the patrolling of vulnerable parts by specially-equipped snow-ploughing engines, and other emergency measures to prevent this driving flurry from setting down and silting up the hollows and cuttings that cross its path.

If these measures fail, the railway, as a feature in the landscape, may disappear from view, its course being indicated only by the tip of a telegraph pole protruding here and there through the surface of the impacted mass of glistening snow. To make confusion worse confounded, it is only necessary for a telegraph pole to be overthrown by the gale, or for a wire to yield under the weight of its coating of snow. Communication with Headquarters is then cut off. The direction of precautionary or remedial measures breaks down, and the weather cannot be prevented from working its wayward will

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until some adventurous telegraph linesman taking his life in his hands, sallies forth into the wintry waste on the hazardous quest of the fault, and by repairing it, permits the relief forces to resume work.

For more than half a century every winter in the north of Scotland has been liable at any moment to produce just such a transformation as here described, sometimes leading up to it steadily by a spell of weather daily becoming more dangerous, or treacherously breaking out without warning and sealing up all the avenues of communication almost before it is possible to realize what is taking place. The annals of these fifty years contain many tales of hair-breadth escapes and perils, some of which would be scarcely credible were they not vouched for by those who had participated in them.

There is, for example, the case of a train that was completely lost for nearly a week in a tremendous snowdrift on Dava Moor. When it was located and dug out, the drift measured 60 feet in height *above the funnel of the engine.* The train crew and passengers succeeded in abandoning the train and, as if by a miracle, reached the shelter of Dava Station before the storm developed an intensity that would have effectually cut off their escape, and thus a catastrophe was averted.

On another occasion, a train with cattle for the Christmas show at Smithfield Market was caught in a blizzard in the same locality and though frantic efforts were made and great risks taken to liberate the animals, these efforts were unavailing and the creatures perished, all of them, by suffocation. The bellowing of the frenzied animals, evidently conscious of their impending doom, could not be recalled without a shudder in the long years afterwards by the men who were the unwilling witnesses of this tragedy. Dava Moor, The Black Tank (near Dalnaspidal) and the County Marches (Inverness-Perth and Sutherland-Caithness) were names of evil omen in those days.

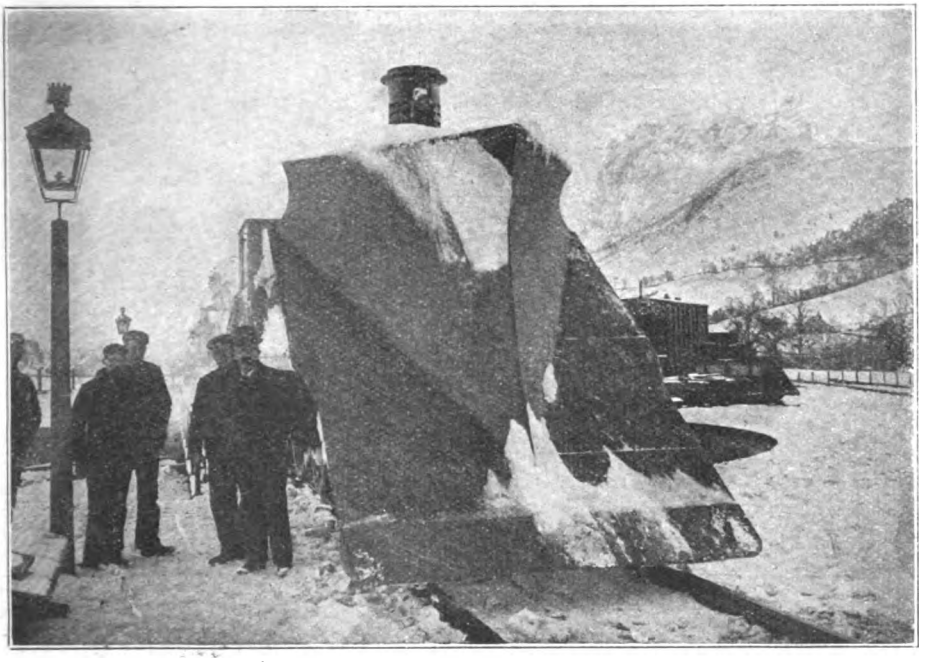

Photo.] SNOW PLOUGH READY TO "CHARGE." [*Munro, Inverness.*

Happily developments have removed the greater part of these danger zones. The new line by way of Carr Bridge gives an alternative route and it runs at a different angle from the old line, so that Dava

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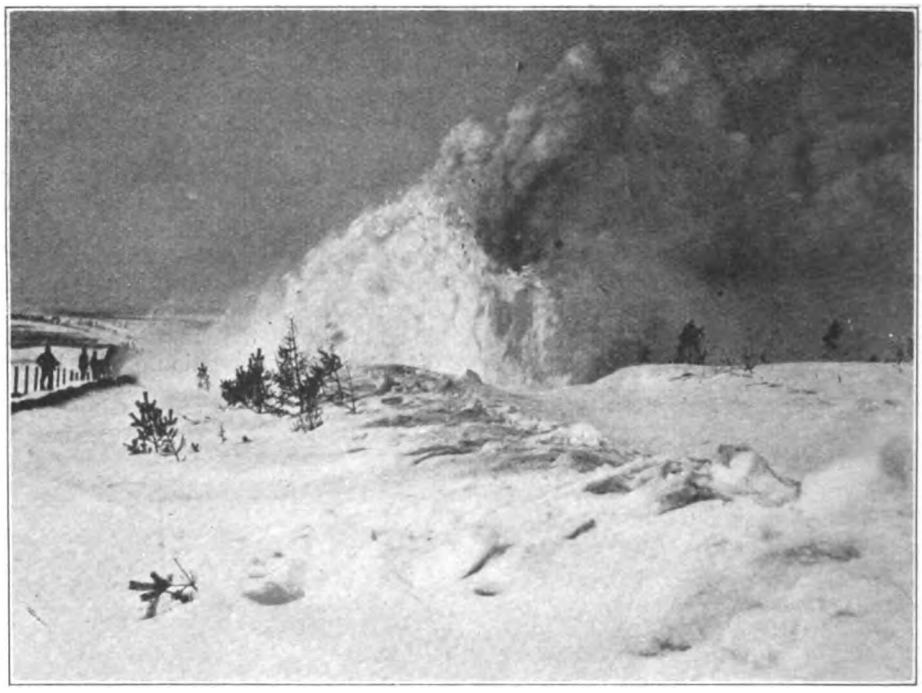

Photo.] "THE CHARGE." [*Johnston, Wick.*

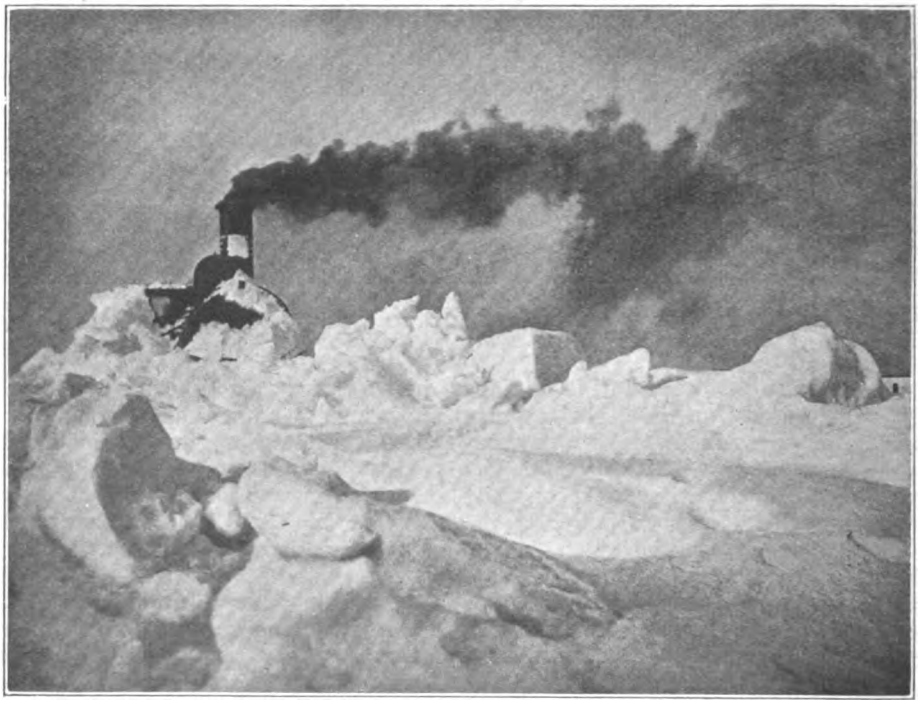

Photo.] SNOW BOUND. [*Johnston, Wick.*

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Moor has been shorn of most of its terrors. It may get snowed up, and sometimes does, without causing more than temporary inconvenience. The Black Tank, formerly a name of dread, has become unfamiliar to more modern ears. There, and at the southern County March, (altitude 1,484 feet), there is now a double line of railway and the increased width between the embankments allows of a freedom of movement which enables the snow ploughs, by efficient patrolling, to keep the lines open, though to be sure there are still spells when the operations are watched with an anxious eye.

The longest and severest snowblock in the annals of the Highland Railway occurred in the winter of 1894-5. It started with a severe blizzard, which disorganised the railway service throughout the whole of Scotland on the 29th of December, and the last of the obstacles to train working was not broken through until the 4th of March. During some part of this period all sections of the Highland Railway were snowed up excepting that between Inverness and Helmsdale. There was no interruption on this last section, and a regular service was maintained on it, only a few trains being missed on account of mishaps. The section from Dingwall to Stromeferry was given up as hopeless for a time, all available forces being concentrated on the section north of Helmsdale. The winter herring fishing at Wick, the most important fishing port in the north, was in full swing, and a determined but vain attempt was made to keep communication open and afterwards to force a way through. This was accomplished towards the end of January, but after a couple of days of calm weather a gale from the opposite direction sprang up and filled all the cuttings again in one night. The predicament was then manifoldly worse than ever. The repeated passage of snowploughs had formed snow cuttings on the levels, and the ordinary cuttings had been doubled in height by the earlier operations. In the worst cuttings on this last occasion each shovelful of snow had to be handled

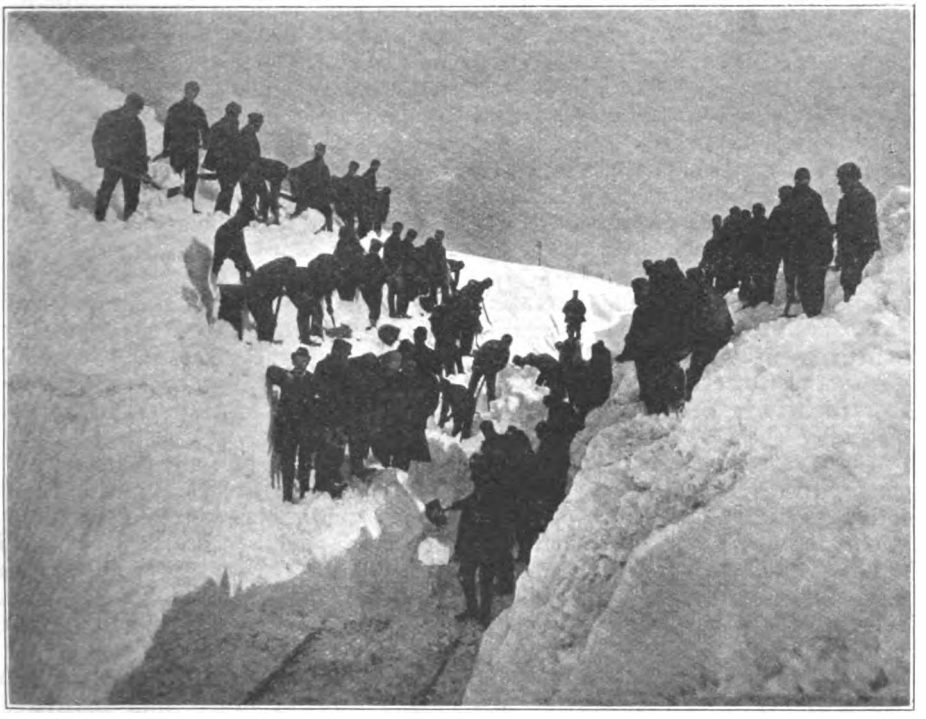

Photo.] "FRONT LINE" TRENCH. [*Johnston, Wick.*

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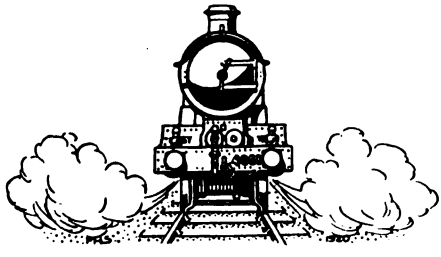
four times by tiers or stages of men to get it "over the top" The first train to be snowed up was a special of fish. At the Fairy Hillocks, on the bleak moor between Altnabreac and Forsinard, this train remained immovable for ten days and it is noteworthy that its burden, of the most perishable commodity transported by railway, was delivered in due course when the train had been released, at various destinations in the Midlands and South of England. There the fish was put on the market and sold without loss; they had been preserved in the biggest cold storage ever heard of.

Frequent mention has been made in this article of the snowplough. This is nothing more than a shovel, but it is a specialized shovel and, as will be seen from the illustration, one on a gigantic scale. It is operated by a locomotive, and, when things become desperate, as many as three powerful locomotives all manned by skilled and fearless enginemen, each the hero of a hundred snow fights, get behind this prodigious implement and retreating for a distance to enable them to gather sufficient momentum, charge full tilt into the obstructing drifts. It is, of course, a rather frightful experience from which one naturally shrinks but no untoward accident has ever been known to happen.

Another picture shows one of these operations actually going on. The locomotives are buried quite out of sight, only the cloud of scattering snow with the black smoke from the funnels showing through it is visable. The "diggers," it will be noticed, have fled to the utmost limits of the fences to escape being knocked down and probably entombed by the snow. This is not an imaginary risk and it would be very difficult to save from death a man who had incautiously got himself into such a predicament.

Besides the patrolling referred to, snow fences are employed at vulnerable places as a preventive measure. These are palings of timber generally formed of discarded sleepers and are about 9 feet in height. They are situated at some distance from the railway and they trap the drifting snow by affording a shelter in which it can come to rest. They have been found to be effective within limits; and, where experience has shown that one line of fence is insufficient, it is duplicated by a second line further out. In spite of all endeavours, however, a stoppage sometimes cannot be prevented, and then the human element has to be called in. First the regular employees, ready for action and looking very efficient, are collected from various directions, and as a last resort, a public appeal will be made and every man who can be enticed by the spice of adventure or the lure of earning an honest shilling will be equipped with a shovel and sent to the front. It will thus be seen that the storm fiend is not to be despised, and that he seldom gets things his own way on Britain's Farthest North Railway.

It is worthy of note that, for several years past, snowblocks on the Highland Railway have been extremely rare, and that such as did occur have been of little consequence, the weather conditions having been as favourable in the Highlands as in any other part of Scotland. A particular characteristic of the climate of the Highlands is its complete immunity from fog, a state of things that may well be envied in populous centres in the South of Scotland and in England.



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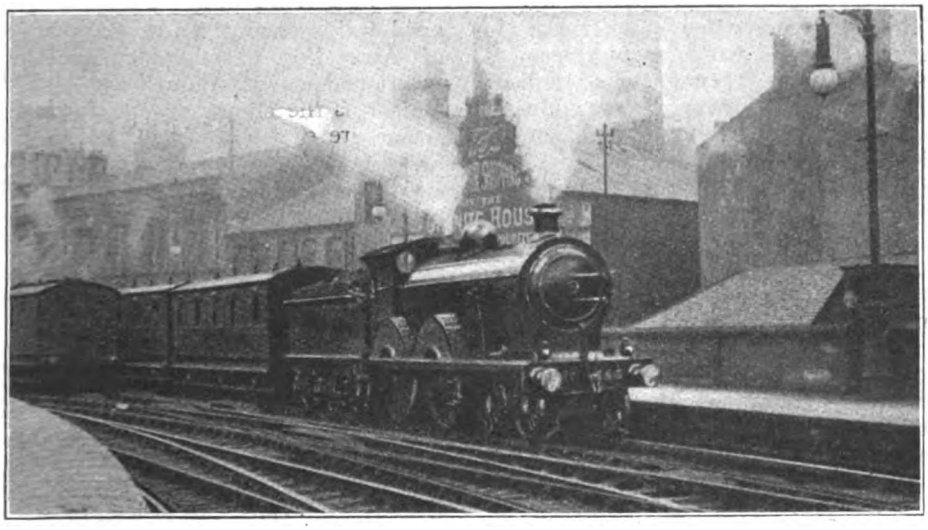

Photo.] **COAST EXPRESS LEAVING ST. ENOCH STATION.** [*J. F. Gairns.*

Rebuilt 4-4-0 locomotive No. 444.

Long Distance Residential Traffic on the Glasgow & South Western Railway.

NOTWITHSTANDING the wide range within which electric tramcars serve the Glasgow district, all three railways concerned provide good train services for residential traffic. They apply, too, over a large area, especially in view of the number of favourite coast resorts within easy reach, so that express trains on many routes are required to meet the needs of daily traffic to and from business, besides some which also connect with railway companies' steamers plying across the Firth of Clyde. As a result, even the winter services include a large number of more or less fast trains making journeys of 30 to 40 miles and which are operated mainly to meet the needs of this traffic, quite apart from those which, although they may make the same journeys and traverse the same routes, are primarily boat trains operating in connection with the numerous steamer services to and from the holiday centres on the Firth of Clyde.

In view of the number of routes which it operates, and the fact that nearly all trains are more or less fast, as inner suburban traffic in competition with the tramways is not very definitely catered for, the services provided by the Glasgow and South Western Railway include many features of interest.

This traffic is mainly centred upon the alternative routes between Glasgow and Paisley, one via the Gilmour Street station in Paisley, using the Joint Caledonian and Glasgow and South Western route, the other the Paisley (Canal) route. These combine at Elderslie, only to divide again into two approximately parallel routes to Dalry, one via Lochwinnoch, the other via Beith. The Greenock line follows the former for a short distance before diverging. Beyond Dalry a branch leads to Kilmarnock, at Kilwinning the Ardrossan and Largs branch diverges to serve the coast; the main line continues to Ayr and then on to Girvan and Stranraer, while several cross routes interlink the direct Ayr line with the main route to Dumfries and Carlisle via the Joint Caledonian and Glasgow and South Western line from Glasgow to Kilmarnock via Barrhead. It is, however, the services via the Paisley stations which call for principal attention

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in the present article. Reference is, however, confined to the winter services, thus applying independently of holiday traffic which calls for very heavy additions during the summer months and at the periods of the Scottish holidays.

From Largs, Fairlie, West Kilbride and Ardrossan the ordinary business trains are the 7.20 and 8.15 a.m., both calling intermediately to Kilwinning and thence at Paisley only, to St. Enoch. On Mondays, however, to meet the needs of week-end traffic, the former train is relieved by one from Ardrossan serving intermediate stations thence to Kilwinning, and running via Paisley (Canal) a few minutes in advance of the usual time, while the main train leaves Largs at 7.30 a.m., and is fast from Ardrossan (South Beach) to Paisley (Gilmour Street) and Glasgow, due at 8.50 a.m.

In the opposite direction the 5.20 p.m. ex St. Enoch is fast to Kilwinning (26¾ miles) except for a call at Paisley (Canal), while there are also fast trains from St. Enoch at 4.0 and 6.9 p.m. going through to Largs. On Saturdays the 1.10 is fast to Stevenston, calling at Paisley (Canal) to pick-up only, followed by the 1.14 p.m. slower train from St. Enoch to Ardrossan. The 2.2 p.m. is a fast week-end train stopping first at Saltcoats (30½ miles), and is followed by the 2.25 p.m. daily train. Seeing that the main traffic of these trains is for stations from 30-43 miles out from Glasgow they afford good facilities from the residential point of view.

On the main line to Ayr the outstanding feature is the Ayr non-stop business expresses. That in the morning starts from Girvan, and from Ayr is non-stop to St. Enoch, covering the run of 41½ miles in 50 minutes, one of the smartest schedules now in force for such traffic. It is a fairly heavy train, and in the timetables the stipulation "No luggage allowed" suggests its traffic importance. The return train leaves St. Enoch at 5.10 p.m., and runs also on Saturdays for general traffic. The equivalent on Saturday afternoons is the 12.30 p.m., though that is a daily train, which calls at Paisley (Gilmour Street) and reaches Ayr in 55 minutes from St. Enoch.

On this route there are several other good trains serving a few stations north of Ayr. For morning traffic may be mentioned the 7.45 a.m. from Ayr which is fast from Troon, except for calls at Irvine and Paisley (Canal), and is due at St. Enoch, 9.5 a.m.; the 8.30 a.m. Breakfast Car express from Ayr which calls at Prestwick, Troon, Barassie, Irvine and Paisley (Canal), reaching St. Enoch at 9.45 a.m.; the 9.0 a.m. from Ayr (through from Stranraer), which serves Prestwick and Troon and calls at Paisley (Gilmour Street) to set down, due at St. Enoch, 10.15 a.m. Both the latter trains also bear the direction "No luggage allowed."

The corresponding return trains are the 5.15 p.m. Tea Car train from St. Enoch, (this calls at Paisley to take up, and on Saturdays to set down also), but is otherwise non-stop to Irvine; the 5.55 p.m. non-stop to Irvine (30¼ miles in 45 minutes), and the 6.20 p.m. which is only a little slower, all these trains also omitting certain stations beyond Irvine. On Saturday afternoons the 1.5 p.m. is non-stop to Troon, as is also the 2.0 p.m., (35 miles in 52 or 54 minutes), while there are slower but still semi-fast trains at 1.11 and 2.5 p.m., apart from others which serve part of the route and stations which are passed by the long-distance "fasts."

On the Greenock line the principal morning expresses are the 8.15 and 9.5 a.m. from Princes Pier Station, both of which are allowed 35 minutes for the very difficult run of 17¾ miles to Paisley (Gilmour Street) and are due at St. Enoch in 50 minutes. There are also trains from Greenock at 7.25 and 7.55 a.m., from Lynedoch at 8.38 a.m. serving local stations, and the 8.45 a.m. which starts from Kilmacolm, and stops only at Bridge of Weir and Paisley (Canal), reaching St. Enoch at 9.17 a.m. A train from Princes Pier at 9.20 a.m., due St. Enoch, 10.26 a.m., provides a later morning service.

Return business trains of special note are the 4.3 p.m., calling at Paisley (Gilmour Street) to pick up, and at Lynedoch, run in connection with the steamers; the 5.3 p.m. non-stop to Bridge of Weir, 13¾ miles in 26 minutes, and terminating at Kilmacolm, these two stations constituting its duty; and the 5.45 p m., also non-stop to Bridge of Weir,

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but which terminates at Greenock (Lynedoch). Other trains for this route at this period are the 5.12 and 6.5 p.m. On Saturday afternoons the 12.57 p.m. is non-stop to Kilmacolm, (17½ miles in 31 minutes); the 1.3 p.m. serves Bridge of Weir (24 minutes) and Kilmacolm only.

On the direct Glasgow-Kilmarnock route, via Barrhead, the principal fast trains suitable for intermediate residential traffic are the 7.57 and 9.0 a.m. ex Kilmarnock, which are fast from Dunlop to Gorbals, 16 miles in 24 minutes, with the 8.20 a.m. on Mondays which calls only at Stewarton, giving a run thence direct to St. Enoch of 19 miles in 35 minutes. The 7.55 a.m. from Beith gives a non-stop run from Barrhead to Gorbals. Return trains of residential importance are the 4.35 p.m. fast to Barrhead, thence all stations to Beith, and the 5.5 and 6.0 p.m. for Kilmarnock, also non-stop to Barrhead, then all stations beyond. Kilmarnock itself gets also non-stop trains from St. Enoch at 4.30 and 5.35 p.m.

Bearing in mind that all the routes concerned are complicated with junctions, and some of them are heavily graded, while at the times of business pressure the lines are carrying a constant succession of trains at close headway, the fact that such facilities are given is evidence of the importance of the traffic of these long distance residential trains. There are, of course, other trains serving stations on the routes concerned, and good facilities are also provided at other times, but the fast trains selected for reference indicate how well this section of traffic is catered for by the Glasgow and South Western Railway.

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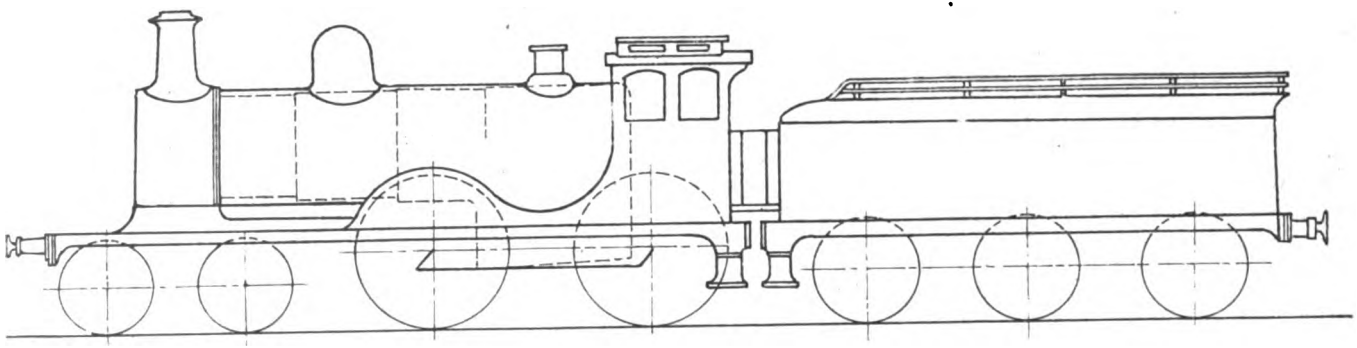
New 4-4-0 Superheater Locomotives, Great North of Scotland Railway.



BY the courtesy of Mr. T. E. Heywood, Locomotive, Carriage and Wagon Superintendent, Great North of Scotland Railway, we are able to reproduce a line diagram showing the main features of a new class of 4-4-0 locomotives under construction for this railway. The design is based upon that of existing locomotives, with link motion valve gear with balanced valves above the inside cylinders, superheating apparatus and Westinghouse quick-acting and Vacuum brakes.

Leading Dimensions.

Cylinders	18 in. by 26 in.
Coupled wheels	6 ft. 1 in. diameter.
Steam pressure	160 lb. per sq. in.
Wheelbase of engine	21 ft. 9½ in.
Grate area	15 sq. ft.

Heating surface, ordinary tubes	512 sq. ft.
" " flue tubes	242 sq. ft.
" " firebox	106 sq. ft.
" " superheater	140 sq. ft.
" " total	860 sq. ft.

Weight of engine in working order, 49 tons 15 cwt.; tender, 37 tons 8 cwt.; total, 87 tons 3 cwt.

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The Case for the Scottish Railway Stockholder.

THREE years ago, or to be precise, at the end of 1917, a society was formed to take such steps as might be deemed necessary to secure fair play for stockholders in Scottish railway companies when a settlement came to be made with the Government at the end of the period of control. The idea originated with certain prominent stockholders who foresaw, from the way in which the finances of the railways were drifting under the non-commercial management of the Government, that the Directors might need the assistance of their stockholders when terms with the Government came to be discussed. The movement, while quite independent of the Boards of the various Scottish railways, was cordially welcomed by them and they have given it every assistance. It is known as the Scottish Railway Shareholders' Protection Association, Limited.

The activities of the Association have up till now been devoted to (1) building up a large membership and to bringing about an organisation of stockholders of all the railways of the United Kingdom; and (2) propaganda work with the view of enlightening public opinion as to the hard position of railway stockholders under the control, in the matter of dividends, in which no allowance has ever been made for the increased cost of living and the rise in interest, or in recognition of the special services rendered by the railways to the country, in peace and in war, and generally as to the claims of their owners to fair treatment. In both these respects the Association has obtained no small measure of success. It has built up a membership of over 33,000, and it has organised a separate Association for stockholders in English railway companies; and a similar one for stockholders in Irish companies, while a Central Council has been set up consisting of delegates from all three Associations, in order to co-ordinate their policy and activities.

The Importance of the Small Investor.

By contributed articles to the Press, and by meetings held throughout the country, the Association has done much to bring the services of the railways, and especially their magnificent assistance to the State during the war, prominently before the public, demonstrating also that the railways do not belong to the capitalist class, but to a comparatively poor but thrifty class who may be styled, for want of a better term, "the small investors." This latter fact has recently been acknowledged by the Minister of Transport, who said that "railway property in this country is owned by the small investor."

Further, the Association has brought to the front the fact that railway investments are very largely held by Life Insurance Companies, Friendly Societies, Trades Unions, Charitable and Educational Trusts, and the like, and that unfair treatment by the Government of the railways would affect not only the direct holders of railway investments, but also millions of policy-holders in insurance companies.

Parliament and the Railway Stockholder.

In addition, the Association has kept prominently before Parliament the cause of railway stockholders, and by means of a deputation to prominent members of the Government was instrumental in helping to get the Government to withdraw from the Bill—which afterwards became the Transport Act—the "Star Chamber" clause under which the Government proposed to take power to acquire the railways by an Order in Council. In July last a representative deputation of the Central Council had a meeting with the Minister of Transport and put before him very fully their objections to the proposals of the Government for the future of the railways,

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as outlined in the White Paper. The deputation was received most sympathetically by the Minister, who undertook to give their representations his careful consideration and expressed his desire to have another meeting.

The Central Council made strong representations to the Chancellor of the Exchequer on his proposal to include the railways in the operation of the Corporation Tax, which would have meant a further reduction in the already meagre dividends, and it was a satisfactory result of their efforts that the Chancellor of the Exchequer agreed that the tax should not affect the railways for a period of three years.

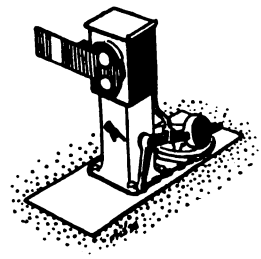
The Chairman of the Central Council, Mr. W. F. Russell, also appeared before the Rates Advisory Committee and made a statement on behalf of the stockholders.

The Government and the Future of Scottish Railways.

With regard to the future, the Association considers that the Government proposals as they stand will have serious effect upon the Scottish railways. The evidence lately given before the Rates Advisory Committee on behalf of the Scottish companies proves to a demonstration how much more severely hit the Scottish railways have been by the increase in expenditure under the Government control than the English railways. Pre-war railway wages in Scotland were lower than in England. Now they are exactly the same, and there is no difference in wages between an employee at a London terminus and an employee of the same grade at a wayside Highland station. To illustrate the result in Scotland of the standardisation of wages and the universal eight-hours day, both imposed by Government, it may be mentioned that the cost of a signal cabin on the Highland Railway is now six times its pre-war cost.

It has been pointed out again and again by the railway companies at the Rates Advisory Committee that in the case of the Scottish companies local rates cannot be so increased as to act as a magic wand to produce the necessary revenue, because obviously there comes a point, especially in a time of falling trade, when they will not only not produce increased revenue, but will actually reduce revenue. Moreover, any increase of Scottish rates beyond English rates would prejudice Scottish traders in competition with traders in the same trade in England.

Three suggestions have been made to meet the difficulty: (1) continuance of the guarantee; (2) the creation of a general pool; and (3) a grouping based upon finance consisting, in the case of the Scottish companies, of three groups based upon the English systems with which the leading Scottish companies are at present associated. The last proposal has everything to recommend it, and it is noteworthy that the proposal to place the Scottish companies in a group by themselves is not only strongly opposed by the companies and by this Association, but also by the traders. If the Scottish group is adhered to, this Association intends to oppose it by every constitutional means as not only likely to prejudice seriously the Scottish companies, but also generally the Scottish people whose interest it is to have commercially sound railways so that they may get quick and efficient services.



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Locomotive and Train Working in the latter part of the 19th Century.

THE LONDON & SOUTH WESTERN RAILWAY. [No. IV.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE last express engines built to Mr. W. G. Beattie's design merit special mention, as they differed in many important essentials from the hitherto standard types. There were twenty of these engines, Nos. 348 to 367, which came from the works of Messrs. Sharp, Stewart & Co., then of Manchester, in the early part of 1877. The outside cylinders were of the large size, for that period, of 18½ in. diam. by 26 in. stroke; the four coupled wheels had a diameter of 6ft. 6 in., and were enclosed in a long rectangular combined splasher, giving the engines a somewhat ungainly appearance, which was not improved by the very plain cabs. The old Beattie copper-topped chimneys disappeared, and the new engines had the severely plain chimney subsequently used throughout Mr. Adams's time. The coupling rods were of the somewhat unusual length for those days of 9 ft. but in spite of this opportunity for providing the large firebox necessary for an engine of such large power, the heating surface of 104 sq. ft. was less than that of many coupled engines on the northern main lines, which had coupling rods of the more usual standard length of 8 ft. 6 in. The coupling rods like those of the Caledonian, Allan's Crewe engines, and the Great North of Scotland outside-cylinder engines, were placed on the crank pins inside the connecting rods and therefore next to the wheels. This has two disadvantages, firstly, the centres of the outside cylinders have to be spaced further apart, and secondly, if a coupling rod should bend or break, the connecting rod has also to be taken down to remove it.

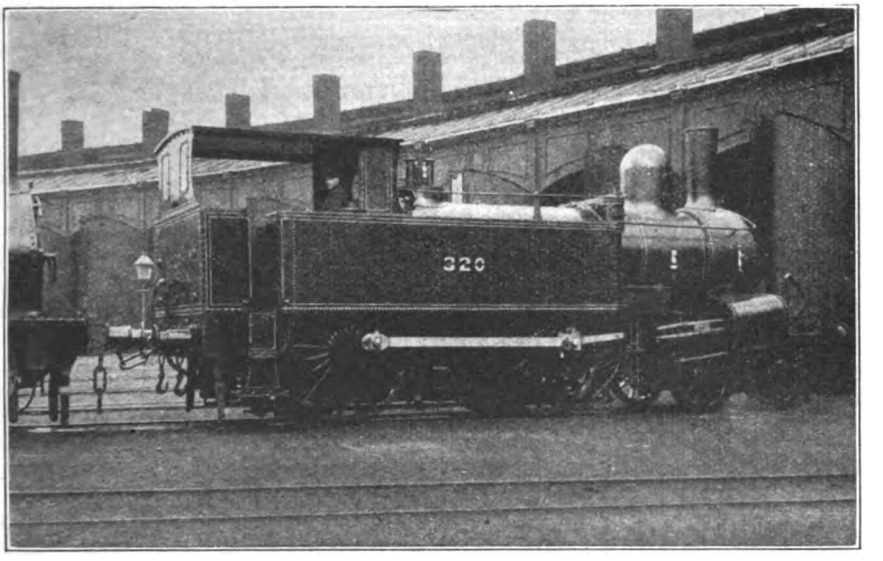

Photo.] [*H. L. Hopwood.*

4-4-0 TANK ENGINE, No. 320 (SERIES 318-323), METROPOLITAN TYPE.

Built by Beyer, Peacock & Co., 1875. Coupled wheels, 5 ft. 8 in. diam. Cylinders, 17 in. by 24 in.

It will be noticed in the case of the outside-cylinder engines, built shortly

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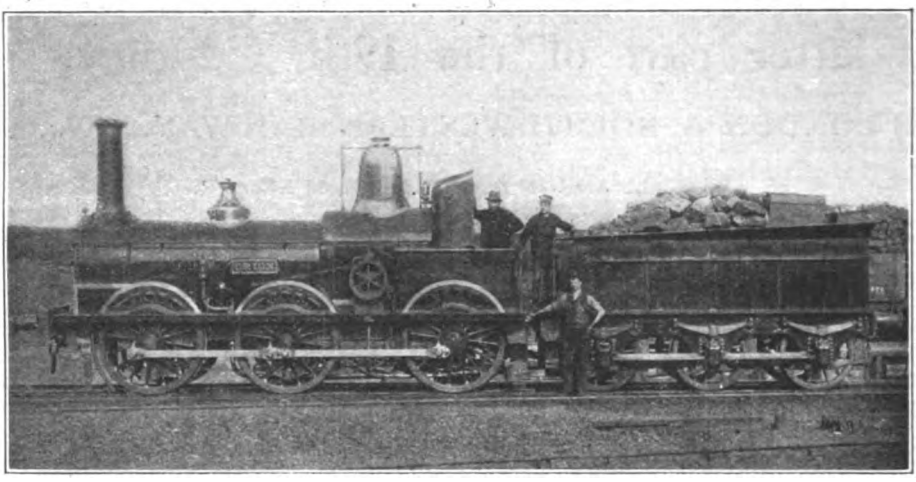

STANDARD GOODS ENGINE, No. 13, "ORION."

Designed by Mr. J. Beattie and built at Nine Elms, 1863, Wheels, 5 ft. diam. Cylinders, 16½ in. by 22 in.

afterwards by Mr. Adams, that the positions of the coupling and connecting rods were reversed, the coupling rods in this case being outside the connecting rods. For the first time in the locomotive history of the South Western, bogies for express engines were introduced in the case of the new 348 class, the wheels being 3 ft. 3 in. in diameter, and spaced 6 ft. 6 in between the centres. Piston valves were also used in these engines. The boilers were not over large for the size of the cylinders; and had a tube heating surface of 1,112 sq. ft. and a total heating surface of 1,216 sq. ft. The pressure carried was 140 lb. per sq. inch. It should, however, be mentioned that the locomotive engineers of those days suffered under certain disadvantages in the matter of designing extra powerful engines, for the weight restrictions were considerably more rigid than they now are, and Mr. Beattie had to content himself with the modest total of 43 tons 8½ cwt. for the engine in working order, of which the coupled wheels carried 27 tons 3½ cwt. The tenders of these express engines were of comparatively small size and carried only 2,250 gallons of water.

It must be at once admitted that the new engines were not a great success, and it might perhaps have been better policy to have constructed one only for extended trials before launching out with a large order for twenty examples of an untried new type. They were intended for the fast heavy main line express trains between London, Salisbury and Exeter, but they proved so unreliable that they did not remain long on these important trains. To begin with, the boilers were really not large enough for the cylinders, and they steamed badly. Liners were put into the chimneys, after which the steaming qualities were improved. The chief source of trouble was the piston valves, which were of the old pattern without collapsible rings, and no relief valves were provided, so that water was being constantly trapped in the cylinders and chests, resulting in a long casualty list of broken and bent valve spindles and a few broken cylinders. After all an engine driver who starts out from Waterloo with an important express to Salisbury, with, say, one stop at Basingstoke, does not feel too comfortable under the knowledge that the chances are pretty considerable that he may have to give up his train and come off in the neighbourhood of Woking. The vagaries of the new express engines were such that they did very little main line work and a number of them were afterwards sent down to Portsmouth for use on the slower trains over the "direct" line.

After Mr. Adams had been in charge of the locomotive department for a short

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time, many of these engines migrated to Northam and Dorchester sheds, and worked the service between Southampton and Weymouth. They had their cylinders altered to 17 in. diam. by 26 in. stroke, and during the years 1888-9, Nos. 348, 349, 351, 353, 354, 356 and 357 were rebuilt by Mr. Adams, who considerably improved them both in appearance and efficiency, but, nevertheless, they were never really satisfactory and the remaining engines of the class were broken up from 1889 onwards with the old boilers.

Some of this class during the early 'nineties were at work on the expresses between Exeter and Plymouth. This road over Dartmoor abounds in very severe gradients in both directions, most of which vary from 1 in 70 to 1 in 80, with one short stretch of 1 in 58. The following is a run by rebuilt engine No. 348 with a load of about 90 tons. Although the load was light the weather was extremely bad, and consisted mostly of snowstorm and head wind. No. 348 passed Crediton, 6½ miles from Exeter, St. Davids, in 12 minutes, Yeoford Junction (10½ miles) in 17 min., Okehampton (25 miles) in 37 min., Tavistock (41¼ miles) in 60 min., and Devonport (57¼ miles) at slow speed in 84½ minutes from the start. Just beyond Devonport a stop for signals was made.

One of the 350 class with the old boiler in 1884 made an excellent run from Honiton to Exeter (16¾ miles) in 16¾ min. start to stop, so that there is no doubt that these engines in spite of their deficiences could run on occasion.

The colour of the South Western engines in the Beatties' time was a dull red, not unlike that of the Furness Railway locomotives. Mr. Adams altered this to a dull yellow-brown colour which was retained until about 1886, when the present light green for passenger, and dark green for goods engines, were adopted. The names of the old Beattie engines were retained in Mr. Adams's time until those engines which bore them were either rebuilt or broken up.

In the early part of 1878, Mr. Adams took charge of the locomotive department, and being an "outside cylinder" man, he continued the long traditions of the South Western in this respect. He had previously been the chief locomotive engineer of the Great Eastern Railway in charge at Stratford Works. His first design for the South Western took the form of twelve mixed traffic engines, of the 4-4-0 type, Nos. 380 to 391 which were built in 1879 by Messrs. Beyer, Peacock and Co. with coupled wheels 5 ft. 7 in. diam. and outside cylinders 18 in. by 24 in. The

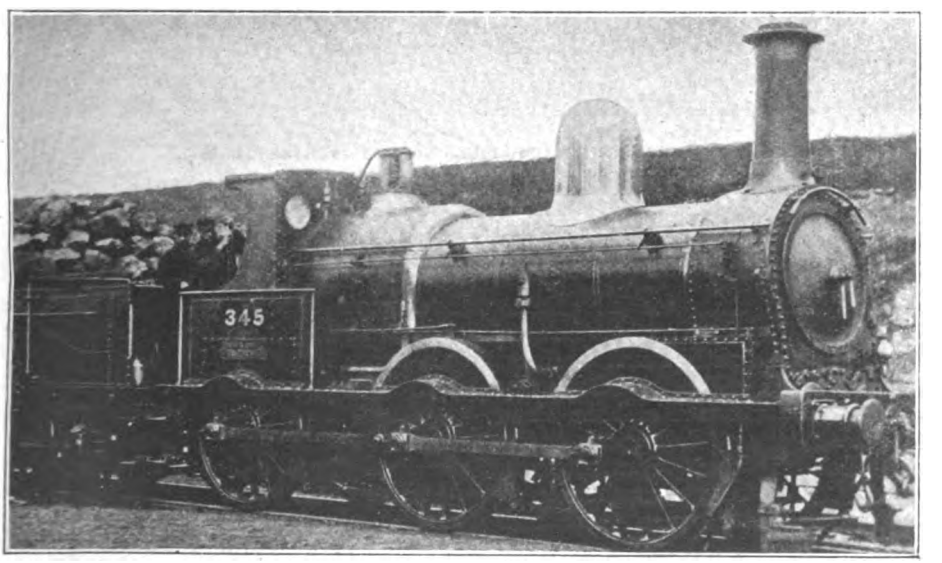

Photo.] **0-6-0 GOODS LOCOMOTIVE, No. 345.** [*Loco. Publishing Co., Ltd.*

Built by Beyer, Peacock & Co., Ltd., 1874-8. Wheels, 5 ft. diam Cylinders, 17 in. by 24 in.

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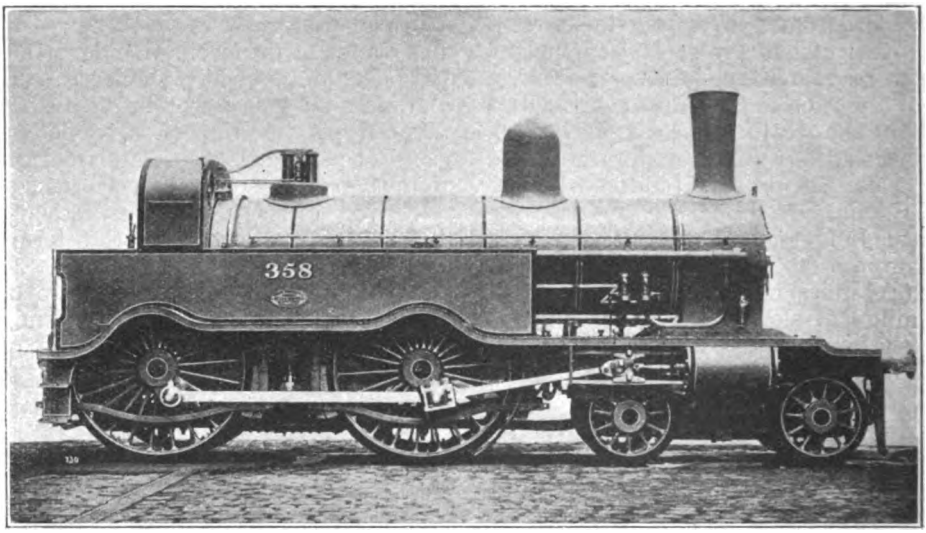
bogie wheels were only 2 ft. 6 in. diameter with solid wheel centres, and there was only one slide bar to each cylinder. The total heating surface was 1,126 sq. ft., of which the firebox contributed 90 sq. ft. A novelty for the South Western was the addition of a steam brake. These engines were much the heaviest that the company had hitherto possessed and weighed 47 tons, of which about 18 tons rested upon the driving wheels, and about 16 tons on the trailing coupled wheels. I have heard it stated, with what amount of truth I do not know, that this weight was somewhat too heavy for some parts of the line and that consequently they could not work certain passenger train services for which they would otherwise have been very suitable. They were often to be seen at one time on some of the heavy business trains on the Richmond road. Originally all of them were stationed at Nine Elms and ran passenger and fast goods trains between London and Southampton. Afterwards they were transferred to Plymouth for work between there and Exeter. In their days they have worked pretty well every sort of train on the South Western except the fastest main line trains, and a visitor to Brent sidings near Cricklewood on the Midland would frequently see some of them on the many coal trains which the South Western takes over at this point.

Mention of the Plymouth line reminds me of the change that has taken place in the South Western geography of this district since the above engines were built. At that time the South Western joined the Great Western branch from Plymouth to Launceston, near Tavistock, and used this railway in order to obtain access to Plymouth. The line was laid on the old "mixed gauge," thereby accommodating the South Western trains. Afterwards the latter railway constructed its own road from Tavistock to Devonport through Bere Alston, and although the distance is slightly greater it had the advantage of giving the South Western an independent line.



4-4-0 EXPRESS LOCOMOTIVE No. 358 (SERIES 348-367).

Designed by Mr. W. G. Beattie, and built by Sharp, Stewart & Co., 1876–7.
Coupled wheels, 6 ft. 6 in. diam. Cylinders, 18½ in. by 26 in.

The first of the express engines designed by Mr. Adams were built by Messrs. Beyer, Peacock and Co., in 1880. They were of the 4-4-0 type with outside cylinders 18 in. by 24 in., and 6 ft. 7 in. coupled wheels, with 3 ft. 4 in. bogie wheels. The tubes had a heating surface of 1,112·2 sq. ft. and the firebox added 111 sq. ft., giving a total of 1,223 sq. ft. The wheelbase of the coupled wheels, was 8 ft. 6 in., or 6 inches less than in

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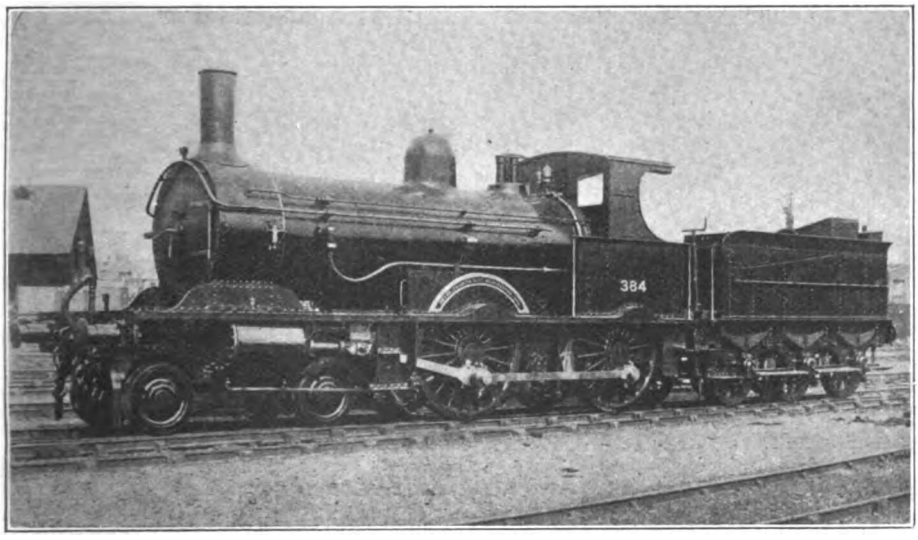
Mr. Beattie's 348 class, and the coupling rods were outside the connecting rods. They were very heavy engines for the period when they were built, and totalled 46¾ tons in working order, as against an average of 42 to 43½ tons for most 4-4-0 engines of that period. The pressure was 160 lb., though some years afterwards it was reduced to 140 lb. The twelve engines of this class by Messrs. Beyer, Peacock and Co., were Nos. 135 to 146, and were stationed at Nine Elms for the best and fastest trains to Salisbury, although they sometimes ran to Southampton. In 1893-4, after larger engines had been put into service, a number of them were transferred to Dorchester for the Southampton and Weymouth service, on which they replaced Beattie's older engines. I believe they are still in existence though I do not think they are much used, and to the credit of the builders I have heard that hardly any of the original rivets have had to be replaced.

Twenty-one additional engines of the same class were subsequently built, of which Neilson and Co. constructed 460 to 469 in 1884 and Stephenson and Co. built 470 to 478 and 147 also in 1884. The last engine of this class, No. 526 was built by Stephenson and Co. in 1887 and exhibited at Newcastle Exhibition. These engines had a total heating surface of 1,162 sq. ft. of which the firebox provided 111 sq. ft. These later engines were stationed at Nine Elms, Exeter, and Bournemouth, with one or two at Salisbury. The individual engines were not usually allotted to any particular station. but were sent as they came out of the shops to such depôts as required one to replace a similar engine sent in for repair.

Prior, however, to the appearance of the later batches of the 6 ft. 7 in. coupled engines, Mr. Adams decided to try larger wheels on the London—Salisbury section just as his predecessor had done, and designed the 445 to 456 class with 7 ft. 1 in. coupled wheels. The cylinders were 18 in. by 24 in. as in the 135 class, and the bogie wheels were enlarged to 3 ft. 7 in. diam. The heating surface was 1,162 sq. ft. total, of which the firebox provided 111 sq. ft. They carried a pressure of 160 lb. per sq. inch. In spite of the larger and heavier wheels these engines weighed nearly 1¼ tons less than the 135 to 146 class, probably owing to the boiler and firebox not being quite as large. The 445 class were built by Stephenson and Co. in 1883 and remained on the London—Salisbury expresses for some nine years when they were replaced by the later 577 class, after which they were mostly sent to Southampton.



4-4-0 MIXED TRAFFIC LOCOMOTIVE No. 384 (SERIES 380-391).

Built by Beyer, Peacock & Co., 1879. Coupled wheels, 5 ft. 7 in. diam. Cylinders, 18 in. by 24 in.

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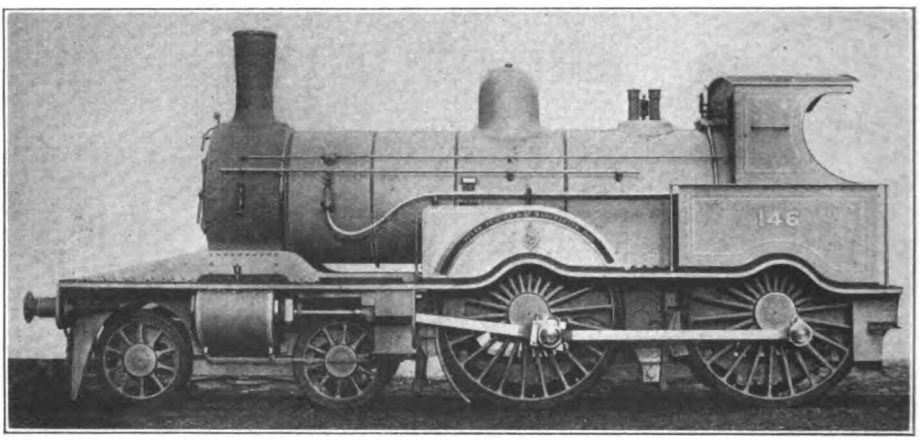
Then compounding had a trial on the South Western. During 1883 Webb's three-cylinder compound engines had been issuing from Crewe works in great numbers to the accompaniment of a mighty blast of trumpets, the sound of which reached the ears of the South Western directors who thereupon took counsel one of another, and concluded that they, too, had better go to the concert whence such a volume of sound was proceeding. So they instructed Mr. Adams to borrow one of the famous engines, and Mr. Webb, nothing loth, obtained permission to send it. In a previous article on the Manchester Sheffield and Lincolnshire Railway I mentioned that the North Western compound engine No. 300 "Compound" was tried on that line, and was then returned to Crewe as "a nice engine with many good points, but——." The unfinished portion of this sentence may be concluded on the South Western, for the same engine put in an appearance at Nine Elms in May, 1884, and made two trips from London to Exeter and back in competition with one of the South Western 445 class. The official account stated that "Compound" worked the 11 a.m. down express from Waterloo to Exeter (171½ miles) and returned the next day on each of the two occasions with the 10.5 a.m. up express. The booked time of the 11 a.m. down was 4 hrs. 13 min. inclusive of six stops. The running average of this train exclusive of stops was about 43·6 m.p.h. throughout; the load to Salisbury was 150 tons, and thence to Exeter 109 tons. The official account further stated that the engine was not quite powerful enough for exceptionally heavy traffic and did not start so readily as the South Western engines, but it showed good climbing power on ascending heavy grades. The fuel consumption was slightly greater than that of the South Western engine, and the balance of time lost and regained by the engine was five minutes against it on the two double journeys. So much for the official account, but the unofficial one, which was in reality much more interesting, was never made public. I collected a few disconnected bits of it only. One bit was to the effect that the blast made by the engine was nearly as loud as that of the Crewe trumpets, and that by the time "Compound" got to Exeter she had developed a variety of red-hot smokebox such as had hitherto been unknown to the railway inhabitants of that district. It is perhaps only fair to add that "Compound" was one of Mr. Webb's earliest and smallest compound engines and that the later "Dreadnought" class might have done better.



4-4-0 EXPRESS LOCOMOTIVE No. 146.

Designed by Mr. W. Adams and built by Beyer, Peacock & Co., 1880.
Coupled wheels, 6 ft. 7 in. diam. Cylinders, 18 in. by 24 in.

Nevertheless Mr. Adams thought that compounding should not be discarded without a fair trial and he therefore altered No. 446 of the 445 class, to the Worsdell two cylinder system. One of the

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two outside cylinders (18 in. by 24 in.) was retained, and a low pressure cylinder 26 in. by 24 in. was substituted for the other. The pressure remained at 160 lb. per sq. inch, but the link motion was modified to give more travel to the valves, which were of the "Trick" or double-ported pattern. These alterations were made to No. 446 early in 1888, and it remained a compound engine for about three years, after which it was re-converted to its original condition. Since then there has been no compounding on the South Western.

As regards express services the South Western was, generally speaking, a somewhat slow railway with a very large traffic, and the trains were heavy. Owing to the competition of the Great Western the average speeds to Exeter were fair on the whole. In 1883 there were three expresses, two down and one up, which averaged 44·3 m.p.h. exclusive of stops, and about 41·2 m.p.h. gross journey speed inclusive of stops. The fastest and incidentally the longest runs were from Yeovil Junction to Exeter ticket platform, a distance of 48½ miles which was covered in 63 minutes by three of the down trains, giving an average speed of 46·2 m.p.h. According to Foxwell the best express was the 2.30 p.m. down from Waterloo, which ran as follows :—

Miles.		arr.	dep.	m.p.h.
	Waterloo		2·30	—
47¾	Basingstoke ..	3·33	3·36	45½
66¼	Andover	4.0	4·2	46¼
83½	Salisbury	4·26	4·32	43
118	Sherborne	5·18	5·19	45
122¾	Yeovil Junction ..	5·26	5·28	—
171¼	Exeter (Tkt. Plat.)..	6·31	6·32	46½
171½	Exeter (Q. St.) ..	6·33		

The above distances as given by Foxwell are ¼-mile shorter than those given in Bradshaw of to-day. I do not know the reason for this; one would naturally expect the mileages of our trunk railways to preserve some sort of invariability except of course when a few corners are flattened out as occasionally happens. The South Western however seems to have been somewhat elastic and has stretched a little during recent years, whereas the Midland contracted a quarter of a mile, which disappeared from the map. "Creep of rails" investigators please note.

The above train was certainly a good one. It was run until 1883 by the 135 to 146 class, and after the spring of that year the 7 ft. coupled engines 445 to 456 took charge of it between Waterloo and Salisbury. Moreover, west of Andover the road is an exceedingly heavy one. But the real express running of the South Western began and ended with the crack Exeter trains, which, as I have said previously, were stimulated by Great Western competition, so that when the other services to Southampton, Bournemouth and Weymouth, and also to Portsmouth, came under consideration, there was a most woeful slump. To these important towns there was no express train which covered the journey at 40 m.p.h. The best trains to Southampton and to Portsmouth averaged 38¼ to 38½ m.p.h. But all expresses on the South Western conveyed the humble third class passenger, and in this respect the line was much better than any of its neighbours, to whom such plebeians were anathema.

In 1884 the run of 23½ miles from Basingstoke to Woking was covered by one train in 28 minutes at the average speed of 50⅓ m.p.h., much the fastest run on the line, and one of the up Exeter expresses ran from Basingstoke to Vauxhall 46½ miles in 60 minutes.

The loads were generally heavy, but as the average speed of most of the trains was not high the engines were seldom severely taxed, except on the steep gradients of the western section. On the other hand pilot engines were fairly frequent in spite of the great weight and the comparatively high power, for those days, of the engines, and an assistant engine was often used with trains of 15 six-wheeled coaches, even over the easy length between Waterloo and Basingstoke. The punctuality of the trains was not so good. This was mainly due to delays at stations, and more especially owing to signal checks on the crowded section of line between Woking and London.

Mr. Rous-Marten gave me some notes of his runs over this line in 1884, of which the best were :—

Waterloo to Basingstoke, 47¾ miles in 60¾ min. Load 120 tons, engine 470 class (6 ft. 7 in. coupled);

Waterloo to Salisbury, 83½ miles in 111 min. running time, deducting 2 stops. Load 165 tons, engine one of 445 class (7 ft. 1 in. coupled);

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Basingstoke to Vauxhall, 46½ miles in 55½ min. running time, deducting 2 stops. Load 140 tons, engine 445 class;

Yeovil to Exeter, 48¼ miles in 62 min. with an engine of the 460 class (6 ft. 7 in.) coupled.

Some ten years later the 445 to 456 class gave some excellent performances with fast heavy trains. The 6.28 p.m. up express from Salisbury was booked to run the 76½ miles to Wimbledon in 92 min., a speed of 50 m.p.h., and with a load of no less than 240 tons No. 447 covered this distance in 89 min. 54 sec. From passing Basingstoke to the Wimbledon stop the time taken for the 40¾ miles was 41 min. 9 sec. only.

A still better performance was perhaps that of engine No. 452, one of the 7 ft. coupled, which somewhat unusually was attached at Salisbury to work the 3 p.m. from Waterloo between Salisbury and Exeter. The load over this very heavy road was 190 tons, and with this load the run from Salisbury to Sherborne (34¾ miles) was made in 42 min. 19 sec., or at a rate of 49.3 m.p.h. The 53½ miles from Sherborne to Exeter were covered in 62 min. 28 sec., or at a rate of 51.4 m.p.h. including a slack to 15 m.p.h. through Yeovil Junction. The minimum speeds were 27.3 m.p.h. up a 1 in 80 bank, and 25.7 m.p.h. up 1 in 70, with maxima of 77.4 m.p.h. and 78.9 m.p.h. on downhill stretches.

The 6 ft. 7 in. coupled engines did, I believe, very good work, but the records in my possession show nothing out of the ordinary. No. 477, with about 140 tons, ran from Salisbury to Templecombe 28½ miles in 35 min. 12 sec. a speed of 48.6 m.p.h., but engine 461 with a heavier load of 190 tons required 38 min. 35 sec. for the same distance in the opposite direction. No. 475 ran from Exeter to Yeovil Junction, 48¾ miles, in 1 hr. 6 min. This, however, does not do justice to the engine, since about 5 minutes were lost owing to slacks.

On the Southampton road a number of fast trains were run by Beattie's 2-4-0 engines; these had hard work with the up trains on the rising gradient from Southampton to Micheldever, and often dropped a fair amount of time over this piece. But they were generally free running engines on the downhill sections and frequently proceeded to give the passengers a somewhat severe shaking up after passing the summit, especially as the trains were made up of the old six-wheeled coaches.

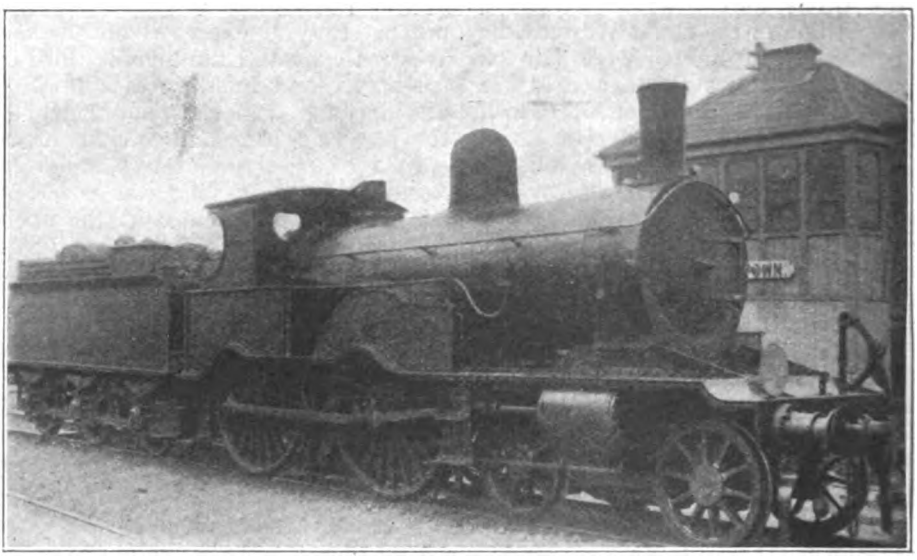

Photo.] **4-4-0 EXPRESS LOCOMOTIVE, No. 447.** [*W. J. Reynolds.*

Built by Robert Stephenson & Co., 1883. Coupled wheels, 7 ft. diam. Cylinders, 18 in. by 24 in.

(To be Continued.)

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THE RAILWAY PORTRAIT GALLERY.

Photo.] **CAPTAIN H. P. M. BEAMES,** [*H. Bullock.*

Chief Mechanical Engineer,

London & North Western Railway.

CAPTAIN HEWITT PEARSON MONTAGUE BEAMES, appointed Chief Mechanical Engineer, London and North Western Railway, in succession to the late Mr. C. J. Bowen Cooke, C.B.E., entered Crewe Works as a premium apprentice in January, 1895, and after serving his time was pupil to the late Mr. F. W. Webb. In 1899 he became junior assistant to the manager of Crewe Works. With the permission of the London and North Western Railway Company, he served in the South African War during 1900-1, returning to Crewe in June, 1901. In 1902 he was appointed Assistant Superintendent, Out-Door Department, at Crewe, and personal Assistant to the Chief Mechanical Engineer in January, 1910. During the Great War Captain Beames was given command of the 110th Company (Railway) Royal Engineers This position he held until released from service abroad to take up the duties of preparing munitions of war and locomotives for overseas service in the capacity of Manager of Crewe Works. In June, 1919, he was appointed Deputy Chief Mechanical Engineer.

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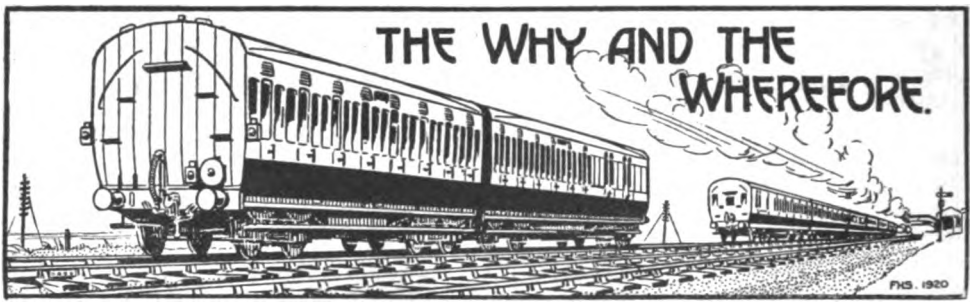

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book." the twenty-third Annual Edition, published in April,* 1920, *is out of print, but a new one is in preparation, in readiness for publication in April,* 1921.

Rule 55.

We have seen the extract from the *Evening News* to which you refer, and it is commented upon in "Pertinent Paragraphs." As the purpose of the boards attached to signals where track circuit renders the carrying out of Rule 55 unnecessary is to advise drivers accordingly, there is no need for special night indication, as the train men soon come to know them, and in any case the fact that the indicating diamond is painted white causes it to show up to some extent at night, though we understand certain railways are introducing purple lights to give a night indication.

[Reply to G. T. LADD.]

Locomotive Regulator Handles.

Regulator handles extending across the cab, as fitted in various modern types of locomotives, serve several useful purposes. They permit of the engine being operated from either side of the cab, which is often a convenience in shunting and similar operations, when the driver requires to look out on either side of the engine. In the event of a mishap, also, such as the breakage of a gauge glass, the ability to shut off steam from the fireman's side of the cab is sometimes valuable; the fireman, in addition, has the means at hand of shutting off steam instantly in case of any sudden illness of the driver.

[Reply to G.T.H.]

Engine Working, Great Western Railway.

Queries of this kind cannot be answered, as methods vary so frequently, and a reply given at one date may be incorrect before it is published. Great Western Railway locomotives which work through between London and Plymouth frequently change trains at Exeter unless they do not stop, partly for convenience in attaching or detaching through carriages, one engine moving off with one portion while a second engine backs on with a new portion, thus reducing the number of shunting movements and avoiding delay.

[Reply to R. W. HANBRIDGE.]

Selby Accident, October 30, 1919.

A Great Eastern Railway train for York was leaving the down platform line to rejoin the through line when its front portion was run into by a Great Northern train (North Eastern Railway locomotive) passing through the station on the through line, against signals. In explanation it was pleaded that on shutting off steam the driver and fireman on the North Eastern Railway engine were prevented from applying the brakes because of back-firing from the firedoor; but this was not substantiated.

[Reply to C. S. ORPEN.]

London and South Western Railway Lines at Yeovil.

The disused line from the Yeovil branch just before the junction is reached,

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and which crosses the Great Western Railway Weymouth line, formed part of the Salisbury and Yeovil Railway, authorised in 1854 and opened for traffic January 1, 1860. It has a length of 30 chains. The opening of the Yeovil and Exeter line in the following month appears to have made the line redundant, and it was subsequently taken up, probably between 1871 and 1876.

[Reply to R. S. ELLIS.]

London and North Western Railway Engine Workings.

It is very unusual in these days for particular engines to be allocated to the working of one train only, day after day, and the working during recent months of the 1.15 p.m. down "Scotsman" from Euston to Crewe by the "Claughton" 4-6-0 *Patriot* is probably the only case of its kind on the London and North Western main line. Generally speaking, there are no set workings of the kind to which you refer.

[Reply to R. S. PEDDER.]

Railway Centenary.

The centenary of the "promotion" of the Stockton and Darlington Railway was celebrated in a small way at Yarm-on-Tees in February last. The opening of that line did not occur however until 1825, so that some time must yet elapse before centenary celebrations receive definite consideration. Centenaries of present individual railways come later still, and we cannot forecast what may be done in each particular case.

[Reply to J.W.T.]

Locomotives with other Tenders.

There is nothing remarkable about the fact that an engine runs with a tender other than its own. It may occur owing to the fact that a tender requires repair, and its engine is therefore given a tender from an engine in the shops, so that both are not rendered "unremunerative" for the time being. Particulars of the 4-4-0 types on the South Eastern and Chatham Railway have several times been given in "The Why and the Wherefore."

[Reply to W.T.R.]

Invergarry and Fort Augustus Railway.

Incorporated August, 1896, and opened for traffic, July 22, 1903, being worked by the Highland Railway until April, 1907. From May, 1907, it was worked by the North British Company, but on October 31, 1911, was closed for traffic. It was reopened August 1, 1913, and again worked by the North British Railway until, in 1914, Parliamentary powers were obtained whereby it became part of the North British system.

[Reply to "SOUTHERN-SCOT."]

Edinburgh and Dalkeith Railway.

Incorporated in 1826, the Edinburgh and Dalkeith Railway was opened in 1831. Its total length (including the Leith branch) was 15 miles. Although a passenger line it was worked by horses, the trains consisting of three carriages. The rail gauge was 4 ft. 6 in. There was an incline near the Edinburgh terminus worked by a stationary engine. Part of the incline was through a tunnel.

[Reply to K.K.B.]

Cab-Signalling, Great Western Railway.

This has been described in the RAILWAY MAGAZINE but not in recent issues. It gives an audible signal (syren) on the engine when an adverse distant signal is passed, and causes the brakes to be applied if disregarded A distinctive audible signal (bell) is also given when the distant is clear. The batteries are connected to the track ramps and are not carried on the engines.

[Reply to E. WYETT.]

Derelict Locomotive Sidings, London, Brighton and South Coast Railway.

Certain stories are current concerning a siding in the East Grinstead district where numbers of derelict locomotives are to be seen; but there is no justification therefor. We understand that at one time a portion of the Ashurst-Eridge spur line was so used to meet temporary requirements, but for some years this section has been used for train running.

[Reply to "DERBY-RED."]

"Third Class by all Trains."

The RAILWAY YEAR BOOK correctly states that in 1872 third-class passengers commenced to be conveyed by all trains on the Midland and Great Eastern Railways. In the case of the former this step is a matter of general knowledge, but advertisements and announcements of the period show that on the Great Eastern Railway also "third-class coaches were

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run on all trains commencing May 1, 1872."

[Reply to A.E.M.]

Auto-Train Services.

The only service of this class now in operation on the Great Eastern Railway is that between Seven Sisters and Palace Gates. Auto-trains are, however, used on several other railways within the London area, including the Great Western, London Brighton and South Coast, London and South Western (Addison Road and Clapham Junction), and London and North Western Railways.

[Reply to G. T. LADD.]

A Locomotive Comparison.

Tractive effort, at 85 per cent. working pressure, of the Great Western 4-6-0 "Stars" (with 15-in. cylinders) is 27,970 lb., and of the London and South Western "Drummond" 4-6-0's of the 330-334 series, 27,500 lb. None of the latter engines have been rebuilt; No. 335 has been reconstructed, but this was a later engine of different design.

[Reply to A.S.M.]

Electric Traction and Wet Weather.

Rain should not seriously affect electric trains where current is collected from a conductor rail, as the insulators are designed so that water shall not interfere with the insulation. From the particulars you give we should consider that the exceptional sparking you witnessed was due to a local fault.

[Reply to "Loco."]

Track Circuit Indicators.

We have already explained several times that white diamonds attached to signal posts indicate that the signal is protected by track circuit and that it is not necessary for the fireman or guard of a goods train kept waiting to proceed to the signal box as a reminder to the signalman.

[Reply to H. C. RAINDLE.]

North Eastern Railway Locomotives.

No. 649 was one of the original two-cylinder 4-4-2 engines. As far as we are aware it is painted the usual green used for the other "Atlantics" and passenger engines. See RAILWAY YEAR BOOK for particulars of the colours of locomotives and rolling-stock on various railways.

[Reply to R.B.W.]

Hundred of Manhood and Selsey Tramway.

"Hundred of Manhood" is the official name of the district in which the line is placed; "Hundred" being an old territorial designation. The line has several times been referred to in these pages, and was described in the September, 1916, number.

[Reply to E. WYETT.]

2-6-2 Locomotive, Midland Railway.

No particulars of this engine have ever been made public. All that is known is that it had eight single-acting cylinders peculiarly arranged, and that it gave a trial to a number of special features from which, apparently, nothing tangible has resulted.

[Reply to F. G. MACCULLOCH.]

0-6-0 Tank Engines, Great Eastern Railway.

These are certainly "wonderful little engines," but the appearance before the war of Nos. 1000 and 1001 (0-6-2 tank) indicated that large engines were contemplated, and probably others would have been since added had not the war intervened.

[Reply to G. T. LADD.]

"DX" Goods Engines, London and North Western Railway.

There is no feature of special note about this numerous class other than the 5 ft. 6 in. diam. of the driving wheels, which is a larger diameter than that of the other 0-6-0 types on the London and North Western Railway.

[Reply to E. L. JONES.]

Great Western Railway Locomotives.

Presumably you refer to the small cylinders placed on the side of the smokebox for operating the superheater dampers. These are not now used, but some of the engines earlier fitted still retain this feature.

[Reply to W. UPTON.]

Sunday Trains on Scottish Railways.

Until recent years there were virtually no Sunday trains in Scotland except those run for mail purposes, and although the Sabbath is not quite so rigidly kept, only a few routes yet have a train service on that day.

[Reply to H. FORDE.]

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Pullman Cars on the Midland Railway.

None of these are still in service, though a few yet remain, as shunters' cabins and for other purposes. It must be remembered that they are nearly 50 years old. They were sent over in parts and re-erected at Derby.

[Reply to A. R. HARRISON.]

Electric Lines, London, Brighton and South Coast Railway.

Standards for the overhead conductors have been erected, but until other equipment for the track and rolling-stock can be obtained no progress can be made with extension of electrical working.

[Reply to G. C. NEWMAN.]

Charnwood Forest Railway.

Opened 1883, from Coalville to Loughborough, 11½ miles, this line was leased to the London and North Western Railway before it was completed and has always been worked by that company. See RAILWAY YEAR BOOK, 1920, page 278.

[Reply to C.R.C.]

Adhesion Weight.

There is no formula for this. It is simply the share of the total weight of the engine which is borne by the coupled wheels, and which is therefore available for adhesion, as stated in the official data concerning each locomotive.

[Reply to W. N. PARRY.]

London and North Western Central Wales Line.

We can trace no record of a Sunday service over this route in past years, save for one train each way between Llangadock, Llandilo and Llanelly. This ceased early in the war.

[Reply to E. L. JONES.]

Midland Railway Locomotives.

We know of no 2-6-4 tank engine in the locomotive stock of the Midland Railway; you are doubtless referring to the 40 engines of the 0-6-4 wheel arrangement—Nos. 2000-2039.

[Reply to G.T.H.]

Edinburgh and Glasgow Railway.

The Edinburgh and Glasgow Railway became merged in the North British under an Act of Parliament passed in 1865, and so ceased to be an independent undertaking.

[Reply to K.K.B.]

Belfast and County Down Railway Locomotives.

Four 4-6-4 tank engines are now in service, Nos. 22, 23, 24 and 25. They are employed on the Bangor branch, working general traffic.

[Reply to H. FORDE.]

Great Central Railway Locomotives.

Four of the 4-4-2 express locomotives are three-cylinder compounds—Nos. 258, 259, 364 and 365. There is also one three-cylinder simple engine, No. 1090. The others are two-cylinder engines.

[Reply to W. N. PARRY.]

Signals on Underground Railways.

One of the lamp signals you have noted is the starting signal (red or green), the other the repeater (orange or green) which indicates the position of the next signal ahead.

[Reply to H. A. POPER.]

"Uniflow" 4-4-2 No. 2212, North Eastern Railway.

A grey livery has doubtless been chosen as the engine is still in an experimental condition. It is really an unfinished lead colour.

[Reply to D. W. ALLEN.]

Longest Platform.

Waverley Station, Edinburgh, has the longest single platform length, 1,680 ft. See RAILWAY YEAR BOOK for particulars of this kind.

[Reply to C. S. ORPEN.]

John Bright and the Railways.

Correct quotation is "Railways have rendered more services and received less gratitude than any other institution in the country."

[Reply to C.H.]

Excavations at Paddington.

Probably you refer to work in connection with the Post Office Tube Railway now being constructed from Liverpool Street to Paddington.

[Reply to T. A. LITTLE.]

Salcey Forest.

This is a village about 2½ miles from Roade station, on the London and North Western Railway, but has no station of its own.

[Reply to C.R.C.]

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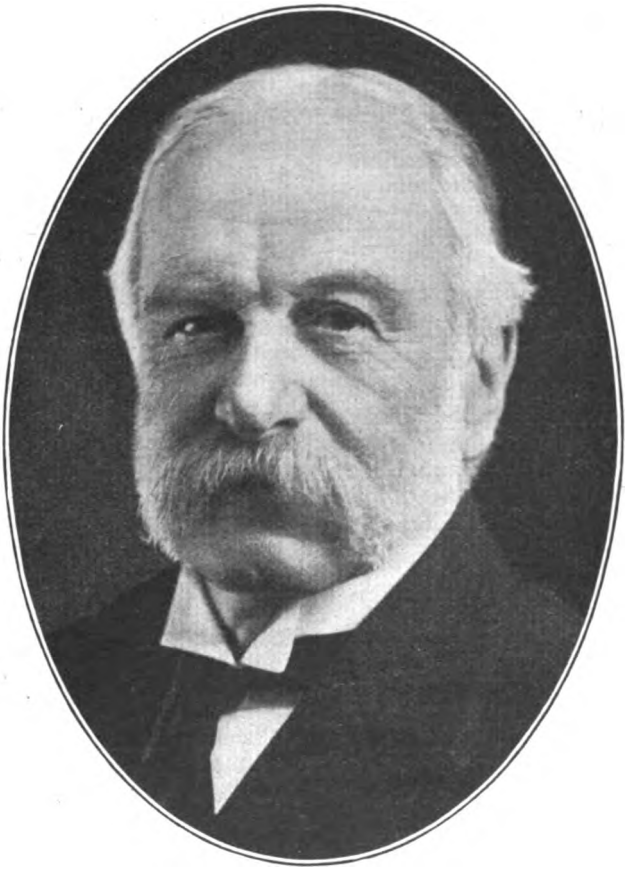
The late EARL OF BESSBOROUGH, K.P.,

Chairman, London, Brighton & South Coast Railway.



Elliott] [*Fry.*

IT is with sincere regret we record the sudden death, on December 2, of the Earl of Bessborough, K.P. His lordship collapsed during a dinner party at Birmingham. The dinner at which the tragedy happened was given to the officers of Guest, Keen and Nettlefold, of which firm Lord Bessborough was chairman. The earl seemed in normal health, but at the close of the evening, while conversing with a group of officials, he was taken ill and died shortly afterwards.

Lord Bessborough, who was in his 70th year, joined the board of the Brighton Railway in 1896, and succeeded Lord Cottesloe as Chairman in 1908. Highly esteemed in the railway world and exceedingly popular with all ranks of the Brighton Railway service, he was keenly interested in the welfare of the workers and followed their doings with paternal concern.

A portrait of Lord Bessborough appeared in the RAILWAY MAGAZINE, April, 1920, in a group, taken at London Bridge, on the occasion of the presentation of honours to those of the employees who had distinguished themselves in the Great War. In warmly welcoming the war heroes, his lordship remarked that the company deeply acknowledged their services, and were very pleased indeed to have them back again. He hoped the distinctions they had received would stimulate them in doing their duty, not only for the railway, but for the country in general.

In addition to being a popular railway chairman, Lord Bessborough was a notable captain in industry. A keen business man he was essentially human, and he never allowed the desire for gain to overcome the generosity of his heart or the kindliness of his spirit. In every sense of the word Lord Bessborough was a nobleman.

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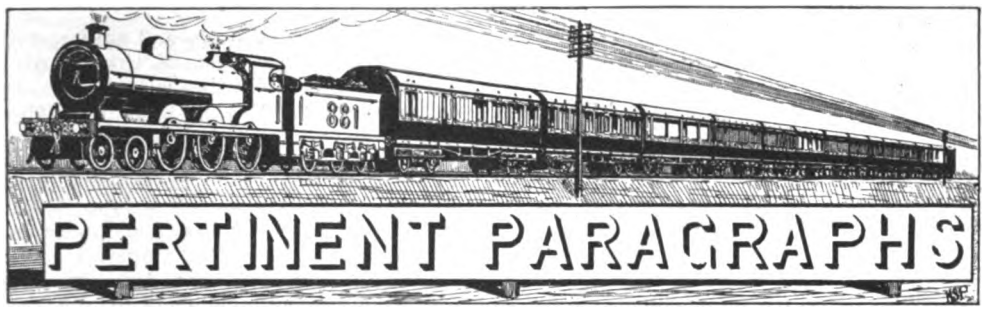

Our Frontispiece.

THIS has been prepared from a photograph by Mr. F. E. Mackay, and represents the 4 p.m. restaurant car express from Carlisle to Glasgow. The engine is one of the standard 4-6-0 locomotives, No. 500 (originally No. 386, built in 1903), rebuilt by Mr. Whitelegg as described in the November RAILWAY MAGAZINE.

Leaving St. Pancras at 9 a.m. and calling only at Leicester, Trent, Chesterfield, Leeds, and Skipton (conditionally), Carlisle is reached at 3.55 p.m. On the Glasgow and South Western Railway a conditional stop is made at Annan, Dumfries and Kilmarnock being regular stops, while a call is made at Strathbungo if required to set down. Glasgow is reached at 6.50 p.m. Although this train is composed of Midland and Glasgow and South Western Joint Stock vehicles, it also included when photographed two London and North Western carriages, the second and third.

Edinburgh to Glasgow, North British Railway.

THAT there should be a whole series of express trains connecting Edinburgh and Glasgow during the course of the day is the natural corollary to the importance of the two chief cities of Scotland; but during the summer period there was one instance of two being run only 10 or 15 minutes apart, this occurring, in fact, in both directions. In each case this was due to the running of the Lothian Coast expresses, the 8.50 a.m. *ex* Waverley being 15 min. in advance of the 9.5 a.m. express and the 3.50 p.m. *ex* Queen Street being 10 min. in front of the ordinary 4 p.m. The Lothian Coast trains ran without stop, and were booked in the even hour for the run of 49¼ miles; the ordinary expresses referred to take 4 or 5 min. longer, but call also at Haymarket, and as the loads are about the same there is not much difference in the engine work called for.

Mr. Allen describes a run with the 8.50 a.m. Lothian Coast express from Waverley, and brief particulars of a journey with the ordinary train behind it may be regarded as complementary. With a load of 10 bogies, about 270 tons, 4-4-0 No. 338 *Helen MacGregor* had a substantial task to keep time, for although the road is virtually level, except for Cowlairs bank, there are no favourable down grades to facilitate fast running. Leaving Haymarket at 9.10.50 a.m., Winchburgh (10½ miles) was passed in 16 min. 10 sec., after which a p.w. slack reduced speed very materially. From passing Philpstoun to Falkirk the 11 miles were covered in 13 min. 10 sec., and thence to Bishopbriggs the run of 18 miles was made in 21 min. Cowlairs was approached very carefully, being passed in 58 min. from the Haymarket start (44½ miles), and after descending the incline with extreme care Queen Street was reached at 10.13 a.m. This was a loss of 2 min. 20 sec., plainly accounted for by the allowance for the p.w. slack en route, for at all stages No. 338 indicated that it could have materially improved upon the running had that been required.

Locomotive Performance on the Glasgow and South Western Railway.

ALTHOUGH, in common with most other lines, Glasgow and South Western express trains are still timed somewhat more easily than in pre-war days, the demands placed upon the engines are by no means light, and as records of locomotive performance on this line have not figured in our pages very prominently for some time past, a few notes concerning some recent experiences with 4-6-0 engines will be in place.

Presumably owing to the operation of the eight-hour day, on neither of the runs to be referred to was the same engine used throughout, and in the case of the 6.40 p.m. ex Carlisle, with a load of three bogie vehicles and two dining cars, representing about 190 tons, an old 4-4-0 engine, No. 409 (previously No. 63, built in 1895), was used to Dumfries. Some good running was, however, put up, Annan, 17½ miles, being passed in 21 min. 50 sec., and the succeeding 15½ miles to Dumfries in 18 min. 10 sec., the complete run of 33 miles being covered in 40 min. No. 512, standard 4-6-0 (previously No. 128, built 1911), was then

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attached. Beyond Holywood the passage of a bridge under repair caused dead slow running, but No. 512 quickly recovered and maintained a steady 50-55 m.p.h. rate over the long rising grades which extend without substantial intermission to New Cumnock, which was passed in 51 min. 45 sec. from the Dumfries start (37 miles), and in 37 min. 55 sec. from passing Auldgirth, beyond the bridge slack, 29¼ miles. The succeeding 21¼ miles to the Kilmarnock stop, were run at steady speed, not exceeding, however, about 70 m.p.h., in 23 min. 25 sec. From Kilmarnock to near Dunlop is very hard, including grades of 1 in 180, 87, 152, and 75, but the 7½ miles were covered in 12¼ min. The succeeding 14¾ miles to a stop at Strathbungo were run in 19 min. 55 sec. St. Enoch was reached at 9.28 p.m., two minutes before time, notwithstanding that Carlisle had been left 5 min. after the advertised departure time.

A return journey by the 10.30 p.m. sleeping car express from St. Enoch, included a load of 5 bogies, 1 six-wheeler, and 1 sleeping car, about 220 tons, taken by No. 501 (previously No. 387, built in 1903) to Kilmarnock. The initial stage is very hard, including grades of 1 in 69 and 1 in 70 before and after Neilston, but the 24¼ miles to Kilmarnock were run in 35½ min. No. 501 was then replaced by No. 496 (old No. 382, built 1903), and the long climb to New Cumnock, 21¼ miles, completed in 36½ min. A steady run down, with the bridge slack near Holywood, brought us past Dumfries (this train does not stop here) in 43½ min. from passing New Cumnock (37 miles), and in 80 min. from Kilmarnock (54¼ miles). Gretna Green was passed in 32 min. from Dumfries (23½ miles), and with a check beyond, an easy run in brought us to Carlisle exactly to time in 44 min. from Dumfries (33 miles), and in 124 min. from Kilmarnock (91¼ miles).

Train Control on the North British Railway.

FROM small beginnings the Train Control System of the North British Railway has now been extended to embrace practically the whole of the industrial areas. The first Control Office established in 1913 was located at Portobello, 3 miles from Edinburgh, but the system then introduced was abandoned three years later for the more up-to-date method now in operation, and the staff transferred to the new Control Office at Edinburgh (Waverley) which forms part of the District Traffic Superintendent's Office for the Central Civision.

Located at Coatbridge, the Western District Control joins up with the Central District at Bathgate Junction, about 8½ miles West of Edinburgh, and embraces the whole of the lines west of that point to Helensburgh, including branches. The radius of the Western District Control is about 60 miles, and controls about 360 miles of rails.

The latest adjunct to the system is the Control Office established at Burntisland, opened in November last, and forms part of the District Operating Superintendent's Offices for the Northern Division. This Control embraces the whole of the area from the Forth to the Tay, including Dundee, with numerous branches serving extensive coalfields. The system in this district would have been in operation some considerable time ago, but during the war period the operations in connection with the installing of the telephone equipment had to be abandoned.

A feature of the North British Railway is that it serves important coal-producing areas in practically every district, and the Control System now introduced at Burntisland is specially adapted to meet the requirements of the compact area covering the Fife coalfields. It is designed with a view to giving the most efficient and economical transport to the large volume of coal produced, and more particularly between the collieries and the large shipping ports of Methil and Burntisland.

The North British Railway is the only company in Scotland to adopt 'Control,' although the majority of the large English railways have had the system in operation on an extensive scale for years. The chief object, of course, is the expeditious handling and transport of traffic, as well as the regulation of trainmen's hours, and the value of the system has been amply demonstrated during the critical years of the war, when the expeditious movement of munitions and other traffic, vital to the country's needs, was of paramount importance.

The progressive policy of the North British Railway Directors in adopting the system is especially marked, and the gratifying results obtained fully justify the introduction.

Portpatrick and Wigtownshire Joint Railways. Larne and Stranraer Royal Mail Steamers.

TRAIN services on the Portpatrick and Wigtownshire Joint Railways have, with the exception of the additional daylight service to and from Ireland, which was not restored this summer, now returned to normal. Although the pre-war timings have not yet been restored, the morning and evening express mail trains have been accelerated.

The engine-shed at Newton-Stewart, which was accidentally destroyed by fire in March, 1919, is being rebuilt; and advantage is

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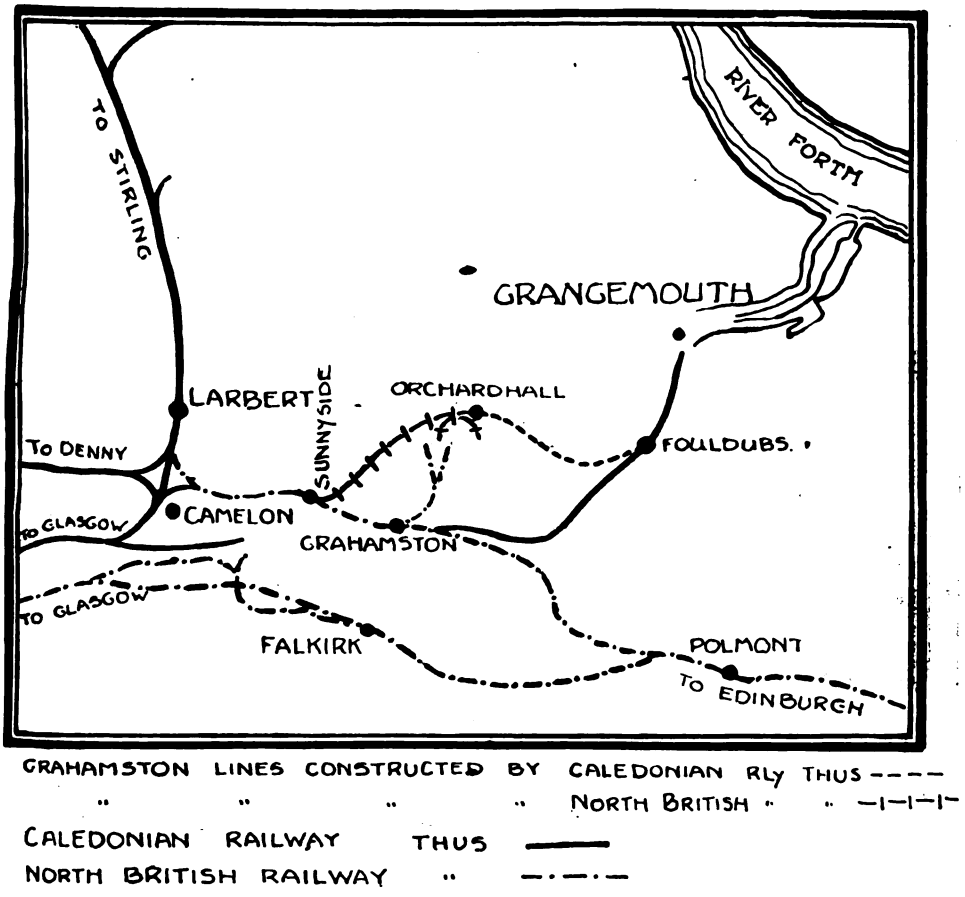
being taken of the opportunity to introduce improved facilities in the locomotive department at that junction station.

Following an abnormal rainfall a bit of embankment near Portpatrick station slipped down into one of the streets of the village on the morning of December 2, rendering the line temporarily unfit for traffic; but a gang of surfacemen was got to work at once, and the line was made passable in a few hours.

maintaining the daily week-day service between Stranraer and Larne

The New Grahamston Lines of the Caledonian and North British Railways.

TRAFFIC to and from Grangemouth Docks, Caledonian Railway, in conjunction with that of the North British Railway in the vicinity, has caused the route *via* Grahamston to be severely congested at times, and to relieve this new lines were constructed and brought



PLAN OF NEW LINES AT GRAHAMSTON, CALEDONIAN AND NORTH BRITISH RAILWAYS.

The *Princess Victoria*, one of the Larne and Stranraer Steamship Joint Committee's fleet of fast mail and passenger steamers was released from Admiralty service on December 31, 1919, after having been on war work as a fleet messenger and transport since October 12, 1914. After reconditioning the ship returned to Stranraer on April 22, 1920, and, along with her sister ship, the *Princess Maud*, takes alternate turns in

into use for goods and mineral traffic on October 23, 1911. As both companies are concerned the new lines are treated as joint Caledonian and North British, though the portion from Sunnyside to Orchardhall (1 mile 44 chains) was built by the North British Company, and the section thence to Fouldubs (1 mile 32 chains) by the Caledonian, under the supervision of the respective chief engineers.

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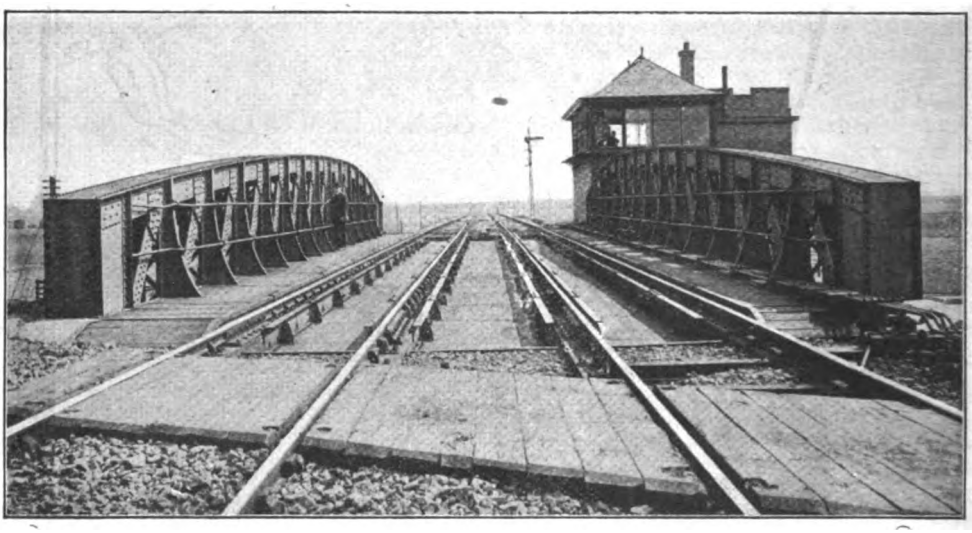
On the Caledonian section there are three over and three under line bridges, one of the latter being a swing bridge over the Forth and Clyde Canal. The main girders of this bridge are 105 ft. 5 in. long, placed at 28 ft. 6 in. centres. The bridge is moved by hydraulic power, the force pumps for which are electrically driven from the district electric supply. On obtaining permission from the adjacent signal boxes at Bainsford and Fouldubs to open the bridge, the first operation of the signalman at the swing bridge box is to release the mechanical lock at the rear end of the bridge. The signalman next raises the bridge on the centre press by means of the hydraulic power, and when it is raised to the extent of 2½ in. the water is cut off automatically. When the bridge is raised 2½ in. at the centre press, the nose end of the bridge is 7 in. clear of its bearing, due to the counter-weight or preponderance of 6 tons at the tail end of the bridge. The hydraulic pressure is then admitted to the turning cylinders, which are provided in duplicate. One pair of these cylinders is capable of opening and closing the bridge. The bridge is turned by means of chains attached between the turning cylinders and a drum fixed on to the underside of the bridge at the pivot.

To avoid delay should part of the mechanism fail hydraulic power can be alternatively applied to raise the rear end of the bridge as required; while if need be it can be turned by hand power.



SWING BRIDGE ACROSS THE FORTH AND CLYDE CANAL AT GRAHAMSTON.

A Big Load and Heavy Gradients.

ENGLISH railways include many steep sections on high speed main routes, but severe gradients may almost be regarded as characteristic of the principal Scottish routes At any rate, the locomotives have to negotiate difficult sections in many places and at times heavy trains have to be worked over them by relatively small engines and a case in point may be briefly described.

The train was the 7.15 p.m. Highland express from Euston, booked away from Carlisle at 2 a.m. non-stop to Stirling. The load consisted of 5 sleeping cars for Inverness and 1 for Oban, with 5 ordinary coaches for the former and 1 for the latter destination, total tare 432 tons. It had been worked by two 4-4-0 engines from Euston to Crewe (No. 2 *Simoon* and No. 1617 *Hydra*), and by 4-6-0 "Claughton" engine No. 2184, assisted by 2-4-0 No. 1187 *Chandos* thence to Carlisle Two Caledonian 4-4-0's Nos. 143 and 137, then came on and covered the 39¾ miles to Beattock in 50 min. 15 sec. In view of the load and notwithstanding that two engines headed the train, banking assistance was taken, and the summit box reached, with an intermediate signal stop, in 28 min. 40 sec. Here, however, No. 137 was detached and No. 143 left to tackle this huge load unaided, except that the banking engine gave it a start. Carstairs (23½ miles) was passed in 27 min. 50 sec., but this was relatively easy. The 10½ miles thence to Law Junction, not unduly difficult, occupied 13 min. 40 sec., and except for one or two fairly short steep sections the chief hindrance thence to Stirling was the numerous junctions and regular slacks while traversing the Glasgow area. However, No. 143 reached Stirling in 48½ min. (33¾ miles), and then essayed to tackle Dunblane

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bank still unaided, but with the Oban vehicles detached, leaving the load at 338 tons. A signal check immediately outside Stirling delayed the start, but the 11 miles to Greenloaning, rising at 1 in 103, 100, 88, 91, &c., to Kinbuck, were covered in 22 min., and Perth was reached in 46 min. 40 sec. from the stop outside Stirling (33 miles), It was obvious at times that No. 143 was working very hard, and time was not quite kept (due mainly to delays on Beattock bank), but at no stage did the engine appear to be working to the limits of its capacity.

A Run with the "Limited Mail."

THIS train, except on Saturday nights, does not convey passengers until it reaches Stirling, where a portion from Glasgow Central station is attached. From Perth to Aberdeen it is the only non-stop, as the corresponding up train calls at Forfar, but smart running, even with a relatively light load, is called for to cover this run of 89¾ miles in 110 min. Passengers are conveyed only according to the accommodation available, hence the term "limited.'

Leaving Perth about 10 min. late one morning recently, No 46, a new superheater 4-4-0, had a load ot 4 bogie vehicles, about 140 tons, so that the initial climb to Stanley Junction had no terrors, this stage of 7¼ miles being covered in 11 min. 10 sec. Thence a steady pace in the neighbourhood of 60 m.p.h. was maintained to Forfar, passed in 26 min, 25 sec. from Stanley Junction (25¼ miles). and 37 min 35 sec. from Perth (32½ miles). The easy run of 15 miles to Bridge ot Dun was made in 15 min. 45 sec. and the harder section of 19 miles thence to Drumlithie in 21 min. 55 sec. The 15 miles of fairly steep undulations to Portlethen were run in 18 min. 35 sec., and Aberdeen reached in 10½ min. for the final 8¼ miles, with a very easy approach, in 105 min. 40 sec. from Perth (89¾ miles) and 66 min 45 sec. from passing Forfar (57¼ miles).

The Shortest Route from London to Manchester.

SEVERAL correspondents have written to point out a still shorter route between London and Manchester than the one detailed in the letter fron a correspondent quoted in "Pertinent Paragraphs" in the December issue. The route in question is from Euston to Colwich over the London and North Western main line; thence over the North Staffordshire Railway *via* Stoke to Macclesfield; and finally over London and North Western metals again through Stockport to London Road, Manchester—a total of 183 miles, 15 chains. This is 1¼ miles less than our original correspondent's route, and is a more "obvious" course, seeing that it is followed daily by two of the principal London-Manchester expresses in each direction; two other up Manchester expresses also travel *via* Stoke, but from there take the Norton Bridge route to Stafford, which is 4 miles further. It is also notable in that the two shortest routes are in neither case the main routes of the Midland and London and North Western Railways. Another correspondent has taken the trouble to work out the best train services available over our correspondent's route on current timetables, and finds that it is as follows:—

King's Cross	dep. 8.45 a.m.
Hitchin	arr. 9.36 a.m.
	dep. 10.00 a.m.
Bedford	arr. 10.33 a.m.
	dep. 10.48 a.m.
Leicester	arr. 12.10 p.m.
	dep. 12.24 p.m.
Chinley	arr. 2.15 p.m.
	dep. 3.42 p.m.
Romiley	arr. 4.08 p.m.
	dep. 4.24 p.m.
London Road	arr. 4.46 p.m.

The total journey time is therefore the modest one of 8 hours, instead of 4½ hours by the best London-Manchester trains; in fact, the 10.15 a.m. from St. Pancras to Manchester, which is used between Leicester and Chinley, leaves London 1½ hours later, and reaches Manchester 2 hours sooner! The connections on the 8-hour journey are, however, remarkably good, with the one exception of the wait at Chinley.

The Co-operative Wholesale Society, Limited and The Guildford Co-operative Society, Limited *v.* The London and South Western Railway Company.

THIS case was heard by His Honour Judge Granger at the Southwark County Court on October 5, and November 2, 1920. Judgment was reserved and delivered on November 23, 1920.

In August, 1919, the Co-operative Wholesale Society, Limited, handed a hamper and a box containing drapery to the defendants at Nine Elms for delivery to the Guildford Co-operative Society, Limited, at Guildford. The defendants did not weigh the goods at Nine Elms but they signed and handed to the senders a receipt for the goods containing a statement of the weight declared by the senders. The defendents also calculated their carriage charges upon such weight, and the charges were paid by the senders.

The packages were delivered at Guildford in good external condition and were signed for as such by the consignees. A few hours later the consignees complained that from the box the following goods were missing—11 Ladies' Coats and a quantity of Elastic; and from the hamper—37 Men's and Boys' Suits. A claim of £65 8*s.* 9*d.* for the value

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of the missing goods was then preferred against the defendants.

The plaintiffs called evidence to show that the full quantity of goods was handed to the defendants at Nine Elms, and they also contended that as the defendants had signed the receipt containing the senders' weight, and had based their carriage charges on such weight, the defendants must be taken to have accepted it, and were estopped from denying that they had received the full consignment. The defendants denied this contention, and called a large number of witnesses to prove that it was more probable that any loss which might have occurred took place before the goods came into their custody. Their evidence showed that it was highly improbable that a pilferage such as was complained of, could have taken place whilst the goods were in their possession, particularly having regard to the precautions taken both at the forwarding and destination stations and during transit by Police and other protection of the defendants' sheds, sidings and premises.

The Judge decided that the defendants were not estopped from denying that they had received the full quantity of goods, and that the plaintiffs had failed to make out to his satisfaction that the missing goods ever reached the defendants' hands. His Honour therefore gave judgment for the defendants with costs.

The Severn Bridge and Power Scheme.

It has been realised for some time past that the needs of trans-Severn communication are not fully met by the Severn Tunnel, which constitutes a "bottle-neck" for the large volume of railway traffic converging upon it at either end, and, apart from the tunnel, circuitous routes or ferry services constitute the only means of crossing the Severn estuary. The Ministry of Transport scheme, of which particulars have recently been made available, actually designed for the utilisation of the exceptional tidal characteristics of the Severn for the production of electric power on a large scale, may therefore supply a solution of the problem with which the Great Western Railway Company is faced, that of duplicating the tunnel or of constructing a bridge, besides providing a crossing for road traffic where none is at present available.

There is no need to review the power characteristics of the scheme, which includes a barrage and dam, electric plants for use when tidal power is available, a reservoir and power plant in the Wye Valley to meet demands at other times, and the formation of huge shipping basins above the barrage. Along the barrage, however, railway tracks are proposed in conjunction with a public roadway, both passing at an ordinary level, so that steep approaches, as would be required by a tunnel or bridge (necessarily at a high level), are avoided. To allow shipping to pass, a large locking basin would be necessary, and to enable road and railway traffic to pass at all times it is proposed to duplicate the railway and road connections, to cross by means of basçule bridges at one end or the other of the locking basin, according to the movements of shipping, so that one or other route will always be available, if not both. The whole scheme is gigantic in conception and must prove expensive; but it would certainly solve the Great Western Railway Company's traffic problem at this point, and it has many meritorious features of more general value.

Railway Working, April-September, 1920.

The Ministry of Transport has issued a statement showing the financial results of working the railways during the six months ended September 30, 1920. Interest centres on the revenue figures for September, which reflect, for the first time, the recent increases in rates, as well as in fares. The returns relate to the whole of the United Kingdom and are, therefore, affected by the disturbances in Ireland. It is understood that the September working of the Irish railways threw upon the Government a liability of £100,000, including the guarantee, and that this liability is increasing.

The surplus for the United Kingdom as a whole is shown as £228,000, so that the surplus in Great Britain alone was nearly £330,000. No previous monthly return has shown a surplus at all, and even in August the Government's liability for the whole of the United Kingdom was £2,155,000.

Passenger train receipts amount in round figures to £11,121,000 as compared with £9,447,000 in 1919, an increase of 17¼ per cent. It is not, however, possible to estimate accurately the effect of the new fares from this month's experience, owing to the disturbing element of the railway strike in 1919, and the fact that in 1920 return tickets at the old fares were in many cases still valid and season tickets did not reflect the full increased yield. In August, it will be remembered, the increases in fares did not take effect till the 6th of the month, and the increases in season tickets again operated only to a slight extent and the workmen's fares not at all. The results for October and November will be affected by the coal strike, so that it will be some time before the Ministry is able to judge at all accurately what the real effect of increasing fares has been.

As regards goods train traffic, receipts for

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September are up to £15,070,000 as against £6,729,000 in 1919, an increase of 124 per cent., but, as in the case of passengers, the railway strike in 1919 disturbs the comparison. Tonnage has increased by roughly 14 per cent., and the increase in receipts is due to this factor as well as to the increased rates. The coal strike and the accompanying disturbance to trade has adversely affected the position, and is estimated to have involved a loss of revenue of, perhaps, £8,000,000. There has also been an unexpected rise in expenditure. This showed itself in September, for which month expenditure on maintenance of rolling-stock was £4,160,000, the highest monthly figure yet experienced; and the rise in wages consequent upon the operation of the sliding scale entails a further heavy increase from the 1st of October.

Increased Fare Railway Statistics.

The figures for August have been awaited with considerable interest in view of the fact that the increase in passenger fares, other than workmen fares, took place on the 6th of that month. The total number of passengers, excluding season ticket holders, conveyed on the railways in Great Britain during the month of August amounted to 147,444,785, which is an increase of 3.3 per cent. as compared with the corresponding month of 1919. It will be remembered that a limited number of excursion trains were introduced in the latter half of August, and these trains conveyed 484,675 passengers. As compared with the month of July there was a decrease in the number of passengers; but July was an abnormally heavy month, showing an increase of over 9 per cent. as compared with the corresponding month of 1919, and doubtless those who were able to do so made their journeys before the increase in passenger fares came into operation.

Owing to the increase in freight rates, as from September 1, the figures of receipts per ton per mile cannot fairly be compared, as they would be misleading, owing to the fact that they would not reflect the receipts either at the old level of rates or at the new level of rates. The figures of operation show a slight decrease in the average wagon load figure, which was only 5·30 tons, the lowest figure since the statistics were compiled. There was, however, an improvement in the average train load as compared with the previous period of 3·99 tons. The August figure was abnormally low and the average train load for the four weeks now issued is still below the average load for three periods during the current year. The average speed for freight trains was 7·93 train miles per train hour, which is slightly less than the previous three periods. Twenty-two additional steam locomotives and 2,021 additional wagons were completed and put into traffic.

New Electric Stock, Metropolitan Railway.

In December, 1919, the Metropolitan Railway placed in trial service an electric train having five single doors on either side instead of the now usual single end doors and double middle doors. This was fully described in the February, 1920, Railway Magazine. After extended service on various routes this train has been found to possess certain drawbacks during the periods of rush traffic, and in the light of experience gained with it another pattern has been evolved, wherein there are three double doors on either side. These are of sliding type and are arranged one in the centre and one towards, but not directly at, each end, as in the present ordinary vehicles. Between the doors the seats are arranged with a midway pair of transverse facing seats on each side of a central passage-way, with longitudinal seats between them and the anti-draught partitions adjacent to the doorways. Beyond the end doors semi-enclosed compartments are formed with a full-width transverse seat along the end wall of the vehicle. Twenty motor cars and 39 trailer cars of the new design have been ordered, and some of the latter have already been placed in service. They are being built by the Metropolitan Railway Carriage, Wagon & Finance Company, Limited, at their Ashbury Works.

A New Explanation of Rule 55.

Track-circuiting has removed the necessity at many places for carrying out this rule, which requires the fireman or guard of a goods train held at a signal to proceed to the signal box to ensure that the signalman shall not overlook the fact that he is keeping a train waiting, and, as we have several times explained in "The Why and the Wherefore," signals which are thus exempt are differentiated by a white diamond-shaped plate attached thereto. These plates have apparently attracted the attention of "Quex," of the London *Evening News*, and recently he attempted to explain them, with distinctly humorous results. Obviously he has sought for information before passing it on to his readers, but in doing so he has plainly got mixed between what he was told and the impressions he gained.

"When an engine-driver reaches a signal and finds that it is against him, he is to wait there with his train until the signal falls, if it is one to which the new board is attached." So far so good; but if, on the other hand, the signal set at "danger" is

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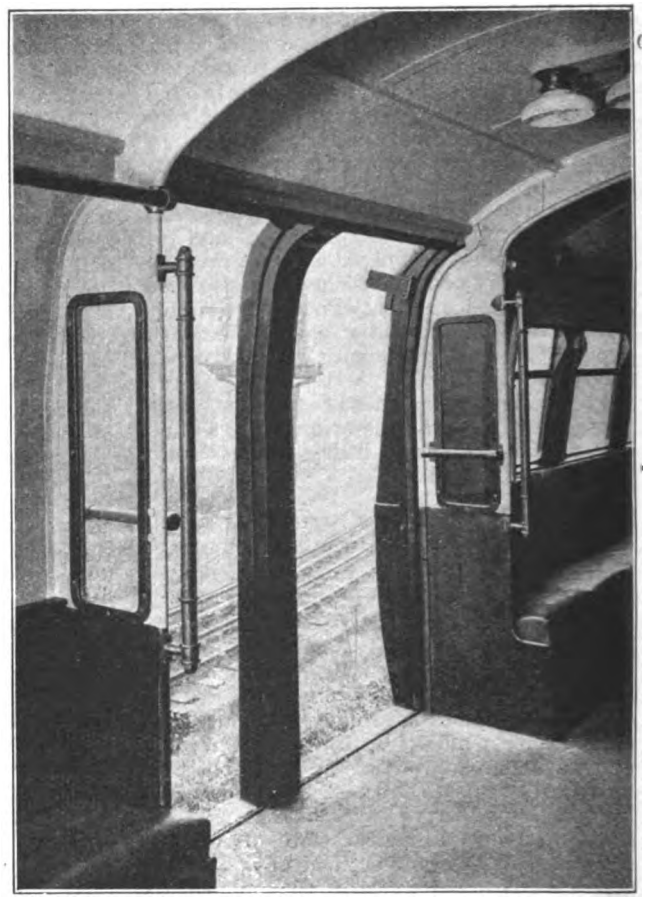
one to which no white board is attached, "he is to *return slowly with his train to the nearest signal box behind him*, and find out what is the cause of the delay." The italics are ours, but one can imagine the situation should drivers act as suggested, especially should another train behind it be waiting at a signal *in advance* of the box by which it is controlled, but which is the "nearest signal box behind" as regards the former train. Presumably, however, the second train would also back, and in the case of a serious delay a whole series would be similarly moving the wrong way, more or less at cross-purposes.

But "Quex" crowns his first blunder, which is perhaps excusable in some degree, by the comment that "the benefits accruing from this system seem small in comparison with the cost of fitting hundreds of signals with the boards!" A few pounds would pay for a hundred or more, including cost of fitting; but surely the writer of this nonsense must have realised that although he may not understand it, there must have been some more substantial purpose, the cost of the boards being relatively insignificant.



NEW ROLLING-STOCK, LONDON ELECTRIC RAILWAY.

Inside View showing Double Middle Doors Open.

New Rolling-Stock, London Electric Railway.

FORTY new cars constructed by Cammell Laird & Co., are being delivered for service on the "Piccadilly" section of the London Electric Railway. Each car accommodates 44 seated passengers, and while there is good standing space, there will be no strap-hanging—in the literal sense of that term. Straps are replaced by hand-poles, both vertical and horizontal, within convenient reach of any passenger who may be obliged to stand. The length of the new cars is 50 ft. overall.

The door arrangements are a special feature of the new stock. In contrast to the older stock, each car has a pair of middle doors instead of double doors, and two single end sliding doors, giving much greater facility of entrance and exit. These doors are operated by air, with electrical control, so devised that, if a door in closing comes in contact with a passenger, its action is reversed at once, so that there is no possibility of entanglement. Moreover, the train cannot start until every door is closed. The passenger is thus fully safeguarded against injury or accident, while the processes of entering or alighting are considerably expedited.

Above the waist of the car, the interior is painted in cream colour, so as to give an even better reflecting surface than hitherto. An elliptical roof replaces the clerestory roof of the older stock, and roof advertisements will be restricted so as to give more light-reflection. Electric lamps run down the centre of the roof for the whole length of the car. Emergency lighting is supplied from a storage battery, and comes into operation automatically in the event of any failure of the ordinary car-lighting. Total cost of the 40 new cars will be approximately £120,000.

The new rolling-stock will relieve congestion in the first place by expediting the

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working of the trains, and it will also enable a 6-car train service to be built up, as each new train replaces and releases a 5-car train of the older stock. These older 5-car trains can then be divided, as the new trains come into working, and added, car by car, to other 5-car trains of the older stock to make them into 6-car trains. This will mean an all-round strengthening of the services, and an all-round lightening of the overload. The 40 new cars will mean an actual addition of more than 26 per cent. to the existing car-strength of the "Piccadilly" line, and an equivalent relief of the "rush-hour" pressure, representing a total gain of 1,760 seats.

The new cars are already being delivered, and several sets will shortly be in service. It is expected that the first of 100 new Metropolitan District cars with three equally spaced double doors on each side, for use in 8-car trains, will shortly be running.

The Fixing of a Fare.

UNDER this title Mr. Frank Pick, Commercial Manager to the London "Underground" Companies, recently addressed the London School of Economics, and in the course of his paper brought forward several important considerations which are not fully realised. In regard to statutory enactments concerning fares, he pointed out that the London Electric Railways (Fares, &c.) Act, 1920, establishes a maximum of 1½d. a mile for ordinary fares, with a minimum of 2d. "The notion underlying it is that the railways are not subject to competition, and therefore the economic factor is inoperative to prevent excessive fares. A false notion twice over. First, because there is omnibus competition. Secondly, because without competition the economic factor remains operative." From this he proceeded to set forth various geographical influences, and the effect which the location of industry has upon residence. This led up to reference to the first omnibuses, and the flat rate fare. "The first omnibus appeared on the scene in 1829, running from the 'Yorkshire Stingo,' in Paddington, to the Bank, for a fare of 1s., including the free use of a newspaper. The first railway entered London in 1837. The first underground opened in 1863. The celebrated penny-a-mile era had dawned. A scheme of fares must stimulate growth. This idea is at the bottom of the flat fare schemes of the mushroom-like American cities. The American flat fare dies hardly. Rather than give it up all sorts of higher flat fares are being tried, *e.g.*, 10 cents in 69 cities, 9 cents in 2, 8 cents in 30, 7 cents in 171, and 6 cents in 149. But there must be a point at which the flat fare scheme is impossible. The street railways of Berlin have tried successively a 30 pf., 50 pf., and 70 pf. (nominally 4d., 6d., and 9d.) flat fare and have continuously failed to secure a revenue adequate to pay their operating expenses. The fares simply killed the traffic. London's own experiment in the flat fare, on the 'Twopenny Tube,' does not furnish anything conclusive as to the merits or demerits of flat *versus* differential fares schemes for London."

First-Class Passengers and Travel Psychology.

Mr. Pick then commented upon the fact that a first-class fare is really extra consideration for a less dense traffic, and if passengers did not take first-class tickets the "Underground" would not retain first-class carriages. If there is to be any limit to London's growth, that limit will be economic and expressed in a fare. People will continue to be drawn into London until it is impossible for them to live on their incomes within its orbit comfortably. The fare between the centre and the outermost suburb will mark the breaking point.

"The more interesting bearings of psychology relate to the individual. A good fare fixer must understand the animal—man. Man wants things cheap, and woman more so. If there is one thing they both want cheap it is their rides. On this account the cost of travel must always be cheap in comparison with the general level of prices current. The price of a reel of cotton may soar from 2½d. to 10½d., and only provoke a grumble but if the price of a ride goes from 3d. to 4d. the passenger at once tries to cut the length of his ride to save the difference. Postage stamps, newspapers, matches may double in price but the bit on the fare is always the last straw. Even more than he wants his fares cheap, man wants them equitable. The Underground has spent a great deal both of money and pains in advertising to the public with the one object of persuading all that its fares were right.

Effect of Fares on Traffic.

"From 1906 down to the opening of the war in 1914, Underground fares were gradually lowered, so long as the volume of passengers to be carried would respond and yield a better final result. Our railway passengers went up from 167 millions to 249 millions in the period, while, in spite of extensions adding to the length of journey, the average receipt per passenger went down from 1.86d. to 1.76d. That is the policy which has excited the Londoner—man, woman, and child—to take over 400 journeys on the average this year. In the anguage of economics, it is a case of testing by progressive production in fares what is the

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marginal demand. The doctrine of charging 'what the traffic will bear' is not founded on a simple supply and demand principle. Underground railway traffics sprang from 300 to 400 millions in three years. The extraordinary traffics which got us into severe disfavour for congestion were, probably, the consequence of our own mistake in not keeping our fares in harmony with the cost of living. The recent increase in fares relieved us of 10 per cent. of our passengers, although our total rise in price namely, 73 per cent., was less than half that of the cost of living as officially calculated.

"Fares can only be fixed by patient research and hard work with accounts and statistics. You must bring to them imaginative treatment. Cost must cover working expenses and outgoings of every sort, a full allowance for depreciation and renewals, and such a return on capital as will sustain the credit of the undertaking. Until that is met there is no real profit. Urban transportation has been consistently sold below cost, and we have reached a stage at which there is no further progress until we are fully solvent."

The Importance of Signalling.

ADDRESSING the graduates and students of the Institute of Transport on Friday, December 3, Mr. Ashton Davies, M.B.E., Superintendent of the Line, Lancashire and Yorkshire Railway, emphasised the importance of "signalling," which he defined as including (1) The signals provided to control the movement of trains, *i.e.*, fixed, hand and detonating signals; (2) the provision of signal boxes and ground frames, with their equipment, including lever frames, locking arrangements and electrical instruments; (3) The Rules and Regulations and instructions applicable in carrying out traffic movements in connection with the use of the installations referred to under (1) and (2).

Fixed signals he placed in two classes: running and subsidiary; the former comprises distant, home and starting signals, and the latter the signals for slower movements, such as siding, shunting, backing, and calling-on, &c., signals. The most important of the running signals is the distant.

The question of simplifying the signalling in short sections has been given considerable attention, and, in the view of some signalling experts, the opinion has been formed that the time has arrived when mechanical or electrical means should be provided which would prevent the distant signal, in the case of short sections, being lowered unless the necessary clearance is available. This condition could be arrived at by providing, say, one distant signal in connection with two signal boxes, and it should not be possible for the distant signal which would apply to the home signals at "A" and "B" boxes to be lowered unless the whole of the stop signals for both "A" and "B" boxes are at the "All right" position, and the arrangements should be such that the signalman at either "A" or "B" could place the distant signal to the "danger" position after it has been lowered if the conditions justified this course being adopted

Permissive Block Working and Hammer-headed signals.

AFTER describing the various types of signals and appliances in detail and reviewing the principal rules and regulations in force, emphasising the fact that only by adequate signalling can traffic be worked during the busy hours at large stations such as Manchester (Victoria), Mr. Ashton Davies referred to special methods, and we may extract from his remarks particulars of certain features of permissive working.

On a section of a railway where the running of passenger trains ceases at, say, 11 p.m. until about 4.30 the next morning, and the goods train traffic is considerable, the workings can and have been expedited by putting into force an arrangement which allows of special permissive signalling instructions being put into operation over running lines during the hours passenger trains are not running. This principle has been further extended to points where, during certain hours of the day, a line is used as a passenger line under the absolute block system, and as a goods line under the permissive system; a good illustration of this is between Thornhill (Midland Junction) and Healey Mills West on the Down North Line, where absolute block is worked for passenger trains and such trains are only allowed to enter the section if the starting signal is lowered, whereas permissive working is authorised for trains other than passenger trains, and a second train may enter the section under the permission regulations provided a special signal (known as the Hammer-headed type) is lowered.

A driver working a passenger train is not authorised to enter the section except by the lowering of the starting signal, whereas the driver working a goods train can enter by the lowering of the hammer-headed signal. This section of line is just in rear of the Marshalling Sidings at Healey Mills, and the arrangement allows of five or six trains following each other to be cleared from the running lines in a short interval of time by placing three of them in the three arrival lines and allowing the remainder to stand behind each other on the Down North Line between Midland Junction and Healey Mills

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West, whereas but for this system of working between Thornhill (Midland Junction) and Healey Mills West, only one train would be able to stand between those Boxes, and the other two would be obstructing sections in rear.

There is a Junction between the North and South Lines at Thornhill (Midland Junction) which allows of trains being turned from the North to the South line past the standing trains, and such a facility is of great assistance in expediting traffic operations.

Reversible Working on the Lancashire & Yorkshire Railway.

In this connection Mr. Ashton Davies provided interesting particulars of arrangements in force between Fazakerley West and Aintree where signalling arrangements and instructions have been put into force which allow of the Up and Down lines being used for running in either direction. For instance, traffic proceeding into Aintree Sorting Sidings and travelling along the Down line from Fazakerley to West Aintree, obstructed the movement of coal from Fazakerley Sidings to the Depôts, whereas now by running the latter trains over what would be the up Line in the Down direction, the two operations do not clash, and give practically the effect of a widening, either line being converted into an Up or a Down Line as may be desired. The general principle of Block working is still maintained, as there can only be one train in the section on the same line at the same time, and when permission has been given for a train to travel in the down direction, the locking and signalling arrangements are such that it is not possible to lower the signals or give permission for a train to travel in the reverse direction. It will, therefore, be seen that the extension of this principle can have far-reaching effects in speeding up operations at different places on the line.

Interlocking Block.

THE system of Interlocking Block put into force on one railway is so arranged that the signal controlling the entrance of trains into the advance section cannot be lowered unless the "Train out of Section" Signal has been given for the previous train, the Home Signal at the Signal Box in advance after being lowered having been placed to "Danger" and the "Line Clear" indication given on the block instrument for the next train.

In the event of a train being brought to a stand at the Home Signal at the Signal Box in advance, and being detained there, the pressing of a plunger provided on the signal post, locks the commutator of the block instrument at the "Train on Line" position, and prevents the indicator being placed to the normal position until the Home Signal has been lowered and placed to the "Danger" position. Such an arrangement is also a good one in the case of parallel lines where a signalman may signal a train, say, on the Up South Line and get it accepted on that line but have the points set for the Up North Line, which may be obstructed, and lower the signals for that line in error.

Mr. Ashton Davies dealt very fully with various traffic aspects, notably goods train control, &c., but unfortunately space will not permit of reference to the many other interesting points which he raised.

Railway Progress in the Malay States.

THERE has just come to hand the report of Mr. P. A. Anthony, C.M.G., General Manager and Chief Engineer, on the working of the railways in British Malaya in 1919. The year under review is the first complete post-war period, and it is therefore not surprising that marked increases appear in practically all the revenue-producing transactions of the railway, but the accompanying increases in expenditure, occasioned by the enormously enhanced cost of materials and higher wages and allowances, outweigh the increases in earnings. There was every indication at the close of the year of still higher working costs in 1920, and Mr. Anthony is of opinion that an increase in goods rates and terminal charges appears inevitable if the railways are to be maintained on a paying basis.

The working for 1919 (after providing for a contribution of £42,104 to the Imperial Government for war purposes) produced a net profit of £386,218 compared with £396,591 in 1918, representing 2·67 per cent. on the total capital expenditure, as against 3·12 per cent. in 1918. Train services in connection with the Siamese Royal State Railways, inaugurated on July 1, 1918, have enabled a considerable traffic, both passenger and goods, to be developed between the two countries. The passenger service over the Siamese Railways is on alternate days, and the time occupied between Bangkok and Singapore is four days (or three days from Penang to Bangkok). It is hoped that this will be accelerated in the near future by the running of express trains over the Siamese system.

A considerable amount of new constructional work is in progress, and trial surveys have been made of possible new lines and deviations, a programme which will entail considerable expenditure during the next few years. The Pahang Section of the East Coast Railway, already open over 141 miles, will be extended to the border of Kelantan (70 miles); the Kelantan section from Tumpat to the Pahang border will be

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108 miles in length, of which 32 miles are already open to traffic; while work has been begun on the section (11¾ miles) to connect northward with the Siamese system at Rantau Panjang. When the East Coast Railway is completed, travellers will have an alternative route from Singapore to Bangkok.

Messrs. Topham, Jones and Railton are the contractors for the extensive railway works at Prai, in Wellesley Province, opposite the island of Penang, which will be an important terminus; and the same contractors are carrying out the construction of a causeway connecting the island of Singapore with the mainland at Johore Bahru. The time allowed for this latter work, which will carry a double line of rails as well as a roadway suitable for motor traffic, is 5½ years.

The Future of the Home Railways.

A LETTER addressed by Viscount Churchill, as Chairman of the Railway Companies' Association, to Sir Eric Geddes, Minister of Transport, has done much to clear the air, as it sets forth the views of the Association in regard to the Government proposals. Moreover, while in many respects the criticisms advanced are destructive, there is also a great deal of valuable constructive suggestion. Indeed, in many respects the arguments adduced appear to be of distinct and tangible value as compared with the vague outline yet vouchsafed on the Government side. The principal points raised will be generally familiar to our readers, except that many of the partisan newspapers have quoted certain portions only, thereby tending to create erroneous or biassed impressions.

In regard to grouping, and it is not clear whether the Government proposes actual amalgamations or grouping for collective operation, the scheme so far outlined is not considered satisfactory. It is suggested that amalgamation of capital should be optional and not compulsory, while the following grouping would be more equitable financially:—

Group No. 1.—London and North Western, Midland, Lancashire and Yorkshire, North Staffordshire, Furness, Caledonian, Glasgow and South Western, Highland.

Group No. 2.—Great Central, Great Northern, Great Eastern, Hull and Barnsley, North Eastern, North British, Great North of Scotland.

Group No. 3.—Great Western and Welsh lines.

Group No. 4.—London and South Western, London, Brighton, and South Coast, South Eastern and Chatham.

Group No. 5.—London Railways (local lines).

This was dissented from by representatives of the North Eastern, Hull and Barnsley, and Barry Railways.

Strong objection was raised to the appointment of representatives of the workers to the boards of directors, and the proposals therefor are regarded as "quite unjustifiable and wrong in principle, and from every point of view objectionable." One effect, it is pointed out, might be to place a servant occupying a subordinate position in authority for the time being, over his official chief. It is thought, however, that the desired beneficial objects can equally well be secured by the appointment of a committee or committees composed of:—

(*a*) Officers to be nominated by the Board;

(*b*) Workers to be elected by and from among the workers, either sectionally or generally, and in such proportion as may be thought advisable;

(*c*) A secretary appointed by the Board; these committees to meet under the chairmanship of a director to consider and make recommendations to the Board.

Financial aspects are discussed at considerable length. Owing to the vagueness of the provisions so far set forth, and the fact that the railway companies can hardly know their actual positions until the anticipated Transport Act becomes law, which may be in June or July next, while the present situation is to terminate in August, it is suggested that the grouping scheme, whatever its form, should not operate until January 1, 1924, and that the Government guarantee should be continued until then, otherwise the railways must operate as separate entities, as in pre-war days, during the intervening period.

Objection was also raised to the claim by the Government in regard to powers of future control, which would, in effect, place the railways under the management of the Ministry of Transport, while nominally returning them to private ownership. Also to proposals to control capital and that the State should share in surplus revenue for general development. It is pointed out in detail that many of the claims advanced cannot be supported either as reasonable or in law, while there is already in existence sufficient legal control upon railway companies to ensure the public being fairly treated and to avoid unjustifiable charges being made, &c. The whole of the letter is, indeed, a well reasoned statement of the railway companies' position.

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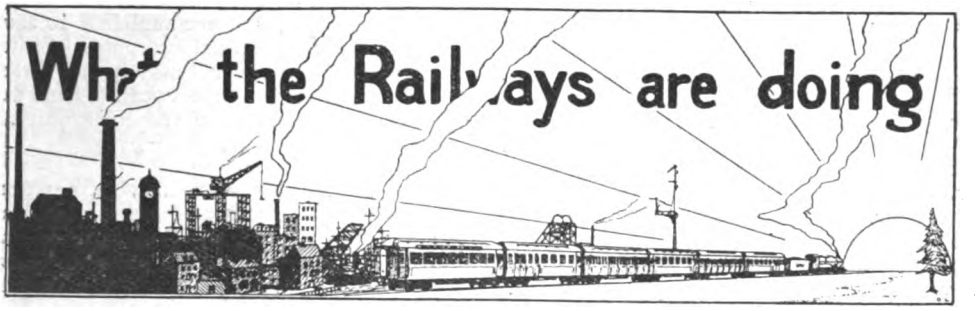

As we go to press it is officially announced that Sir Thomas Williams, General Manager of the London and North Western Railway, retires at the end of 1920, and joins the board, and that Mr. Arthur Watson, C.B.E., the General Manager of the Lancashire and Yorkshire Railway, has been appointed as his successor, and in agreement with the boards of both companies and in their joint interest is to continue as General Manager of the Lancashire and Yorkshire Railway.

* * *

Col. J. S. Dennis, C.M.G., who recently arrived in London, is the Chief Commissioner of Colonization and Development of the Canadian Pacific Railway. He is one of the best-known "old-timers" who have established a prosperous and well-settled Western Canada, having been identified with the development of that great region since 1872—first with the Hudson's Bay Company, then as Inspector of Surveys for the Canadian Government, Deputy Minister of Public Works in the old North-West Territorial Government and, later, as Assistant to the President of the Canadian Pacific Railway. During his connection with the last-named Company, which dates from 1902, he has been responsible for the creation in Southern Alberta of the largest individual irrigation project in America. For many years he has been in charge of the Immigration and Land Settlement policy of the Canadian Pacific, which has been the means of settling hundreds of thousands of British, American and Canadian farmers upon the Western Provinces and amongst the notable schemes that he inaugurated, of especial interest to the British emigrant, is the "Ready-Made Farm" idea. Colonel Dennis has also had considerable military experience dating from the Riel Rebellion in 1885. During the war he was second in command of the British Canadian Recruiting Mission in the United States, which was instrumental in recruiting over 30,000 British citizens, resident in the United States, for the British and Canadian Forces. In 1918 he went to Siberia with the Canadian Expeditionary Force, in charge of lines of communication, transportation, accommodation and general information. He commanded, in addition, the Red Cross Expedition to Siberia, as Commissioner, and was Chairman of the Canadian Trade Commission at Vladivostock.

COL. J. S. DENNIS, C.M.G.,
Canadian Pacific Railway.

* * *

An interesting event took place at Amiens Street Station, Dublin, on December 10. Mr. Sam Berkeley, Assistant Superintendent of the Great Northern (Ireland) Railway, recently resigned that service to take up an important appointment in connection with cross-Channel shipping now controlled by the Coast Lines, Limited, and his many friends and colleagues met for the purpose of making a presentation and wishing Mr. Berkeley success in his new position. The presentation took the form of a magnificent gold watch and chain, a Louis XV silver

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tea and coffee service, together with a cheque, the amount of which bore testimony to the popularity of the recipient. Mrs. Berkeley was also presented with a very fine gold watch-bracelet. In the unavoidable absence of the General Manager—Mr. John Bagwell—the chair was occupied by Mr. R. J. Moore, Superintendent of the Line. Mr. Berkeley joined the service of the Great Northern twenty-seven years ago, and few men of his years have had such a varied experience in railway work in Ireland. He served under three general managers—Messrs. Robertson, Plews and Bagwell. Six years as confidential assistant to the late Mr. Plews gave him a vast experience in matters of administration, and under Mr. Bagwell he got a further opportunity of a practical knowledge of out-door railway operations. Merit alone secured for him promotion to the position which he has just vacated, he was closely associated with the many improved workings recently carried out on the Great Northern Railway system, the services on which line are now second to none in the kingdom He is well known to the commercial public in Dublin and the North of Ireland as a courteous official, and many will regret his severance from the railway world. The shipping concern to which Mr. Berkeley has transferred his energies is to be congratulated on securing such a capable, courteous official, and he undoubtedly carries with him the heartiest congratulations and good wishes of his railway colleagues and many friends in commercial circles.

* * *

RETIREMENT from the railway service does not of necessity mean the relinquishing of the activities of life. A case in point is that of Mr. W. Sparks, who, after 46 years' association with the Great Western Railway, retired from the service nearly 10 years ago. Mr. Sparks, who was in November re-elected a Member of the Reading Town Council, will be remembered at Poplar, where he spent 17 years, leaving there in 1896 to take up the position of district goods manager at Gloucester. In 1902 he was transferred to Reading in a similar capacity and there remained until his retirement in June, 1911. His council work is much appreciated in Reading, and he has served upon an extraordinary number of committees. Since 1912 he has been a member of the Reading Board of Guardians, and a hard-working one at that. Church work, including the vice-chairmanship of the Greyfriar's Parochial Church Council, likewise has the advantage of Mr. Sparks' untiring energy. The offices mentioned by no means exhaust the list of Mr. Sparks' services for the commonweal, but are sufficient to show how very busy a practical and public-spirited "retired railway officer" may be kept when once he has decided to devote his time and abilities to the service of the community.

* * *

MR. T. M. WILLIAMS, C.B., retired from the position of Docks and Marine Manager on November 30, and the London and South Western Railway directors have appointed Mr. G. S. Szlumper, the Deputy Docks and Marine Manager, to succeed him.

* * *

MR. F. W. DINGLEY has been appointed, from December 1, Chief Locomotive Running Superintendent of the London and North Western Railway. Mr. Dingley has taken control of the Running Department, including locomotive steam sheds and outside shops. His office is at Crewe. Mr. Dingley comes of a railway stock, his great-grandfather having been a storeman for the firm of Messrs. Boulton and Watt; his grandfather was in the Locomotive Department of the Grand Junction Railway, and was subsequently transferred to Crewe as foreman of the erecting shops; whilst his father was shed foreman at Springs Branch Engine Shed. Mr. Dingley himself was assistant locomotive foreman at Willesden Shed, foreman at Bushbury, and foreman at Willesden. In 1909, he was made Assistant to the Chief Mechanical Engineer for the London Division, whence he was removed to Crewe to take the position of Motor Road Superintendent, which position he held until, in 1919, he was made outdoor Mechanical Superintendent, London and North Western Railway.

* * *

AT a meeting of the Board of the London, Brighton and South Coast Railway, on December 8, Mr. Charles Colin Macrae, the Deputy Chairman was elected Chairman of the Board in succession to the late Earl of Bessborough, and Lord Henry Nevill was elected Deputy Chairman.

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We regret to record the death of Mr. Thomas Chellew Jenkin, a director of the City & South London Railway and formerly its general manager. Commencing with the South Devon Railway from which, after several years' service, he transferred to the Great Western Railway, Mr. Jenkin subsequently entered the service of the London, Tilbury & Southend Railway, and finally in 1890 was appointed General Manager of the City & South London Railway, some few months before the line was opened for passenger traffic.

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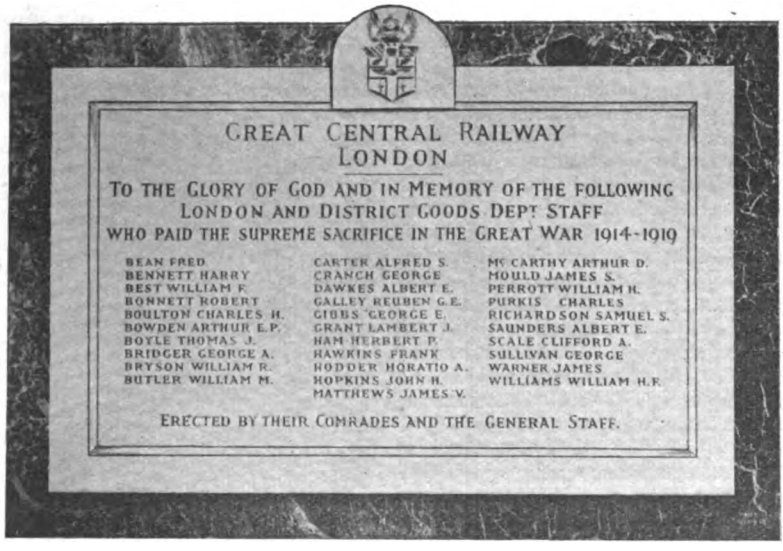
SIR SAM FAY, General Manager, Great Central Railway, recently unveiled a tablet "To the Memory of 31 Members of the London and District Goods Department Staff who made the Supreme Sacrifice in the Great War." Mr. G. Parsons, District Goods Manager, presided, and among the officers of the Great Central Railway present were Mr. D. H. Davies, Solicitor; Mr. J. Rostern, Chief Goods Manager; Mr. W. Clow, Superintendent of the Line; Mr. C. W. Neele, Electrical Engineer; Mr. A. Oldham, Assistant Superintendent of the Line; and Mr. E. Livesley, Assistant Goods Manager. The memorial is fixed on the wall of the main entrance to the Marylebone Goods Station. In a few well-chosen words Sir Sam alluded to the great sacrifice made by the men who had fallen, and said that the freedom we enjoyed to-day was solely due to them and their comrades "who died that we might live." He mentioned that 14 per cent. of those who joined the Forces from Marylebone Station had paid the supreme sacrifice. The cost of the memorial had been subscribed by the comrades of the men themselves and the general staff, and he thought it very fitting that this memorial, which was placed in such a prominent position, should be erected and the names of the men inscribed in marble, so that those who followed after would have some definite indication of the gallant men whose heroism they were commemorating that day. On concluding his speech, Sir Sam placed a beautiful wreath on the tablet.



GREAT CENTRAL RAILWAY WAR MEMORIAL.

WHEN the "Underground" group of London Electric Railways and its associates take in hand a staff function, nothing is too much trouble to ensure its success. The recent T.O.T. Concert at the Albert Hall was another triumph in organisation, as well as a musical success of no mean order. The T.O.T. Philharmonic Society, founded in January, 1920, is a development of the Grosvenor Road Choir, formed in 1916 and the "Victory Day" choir and bands which figured in 1919 at the welcome home to the 10,000 members of the staff returned from war service, given at the Royal Albert Hall. These efforts were so highly appreciated that the T.O.T. Philharmonic Society was inaugurated in January, 1920, with the Right Hon. Lord Ashfield as President, the inaugural concert being held in March at the Central Hall, Westminster, followed by another in the following month. An orchestra was added at the commencement of the present session, and the total membership of the Society is now: Choir, 400; bands, 110; orchestra, 60. An operatic and dramatic section has been organised and the first production is to be presented early in 1921. The keen support given by the directors and officers of the allied companies is proved by the presence at the Albert Hall concert of Lord George Hamilton, Viscount Knutsford, Lord Stuart of Wortley, Sir James Devonshire, Sir Alexander Roger, Sir L. Coward, Mr. H. A. Vernet, Mr. Murray Griffith, Mr. L. Robinson, Mr. G. Watson, and Lieut.-Col. W. Dumble,

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directors of the various associated companies; and the following officers: Messrs. H. E. Blain, C.B.E. (Operating Manager), Z. E. Knapp (Manager for Maintenance, Railways), G. J. Shave (Manager for Maintenance, 'Buses), F. Pick (Commercial Manager), G. J. Spencer (Manager, Tramways), J. B. Lindsay (Assistant Secretary), J. P. Thomas (Assistant Operating Manager), J. Thornton (Superintendent of the Line), A. R. Cooper (Engineer), W. A. Agnew (Mechanical Engineer), S. J. Webb (General Passenger Agent), Captain Rozier (General Superintendent, 'Buses), A. V. Mason (Engineer, Tramways), J. B. McKinnon (Superintendent, Tramways), J. C. Mitchell (Treasurer) and C. S. Touch (Accountant).

* * *

At the instance of the Newport Harbour Commissioners the Ministry of Transport recently held an inquiry in the Town Hall, Newport, Mon., with the following terms of reference:—

"To advise the Minister of Transport whether it is desirable in the national interest that the transport facilities and accommodation of the Newport Harbour should be improved or extended, and if so, in what direction they require improvement, and by whom should the improvement be effected."

Evidence was given on behalf of the Newport Harbour Commissioners in favour of the River Usk being developed in the national interest; but, although no definite schemes or estimates, financial or otherwise, were adduced, the broad view expressed on their behalf was in favour of a system of public wharves. Evidence in opposition was given on behalf of Guest, Keen and Nettlefolds, Limited; John Lysaght, Limited; The British Mannesmann Tube Company; The Newport and South Wales Steamship Company; Rennie, Ritchie and Newport Shipbuilding Company; The Ebbw Vale Steel, Iron and Coal Company, Limited. The Cardiff and Newport Patent Fuel Company; Happerfield and Willans; Partridge, Jones and Co., Limited; The Bristol Channel Dockowners' Association; and The Alexandra (Newport and South Wales) Docks and Railway Company. The case was also watched by representatives from the Great Western and Barry Railways. Put shortly, the contention of the opposition was that ample accommodation already exists, both for present traffic and the needs for some time to come, and that strong exception would be taken to any schemes which might result in increased dues for shipping using the harbour, or entailing an addition to the town's rates. Afterwards the Committee inspected the fine docks of the Alexandra Company, and were obviously much impressed with the ample and up-to-date character of the facilities provided.

* * *

The first congress of the Institute of Transport will be held at Manchester on Thursday and Friday, January 27 and 28, 1921. On the opening day, the proceedings, in addition to official functions, will comprise two sessions, at which papers will be read and discussed as follows:—*Morning Session*: "The Development of Mechanical Road Transport," by Mr. C. le M. Gosselin, Managing Director, H. Viney & Co., Limited, Preston. "Behind the Scenes in a Railway Locomotive Workshop," by Mr. J. W. Smith, Locomotive Works Manager, Great Central Railway, Gorton.—*Afternoon Session*: "Roads and Road Transport," by Mr. J. Cracroft Haller, County Surveyor, Nottinghamshire. "The Problem of the Canals," by Sir John Eaglesome, K.C.M.G., General Manager, Aire & Calder Navigation, Leeds. On the second day, a visit will be paid to the Manchester Ship Canal, by special invitation of the directors, and additional visits to places of interest in the vicinity will be arranged. The Congress will be open to all Corporate Members, Graduates and Students of the Institute. A complete programme will shortly be issued, together with forms to be exchanged for the requisite Congress ticket and cards of invitation to social functions. Secretariat: Mr. H. E. Blain, C.B.E. (Hon. Secretary of the Institute), Major H. Mattinson, R.E. (Civil Engineer, Manchester Tramways) and Mr. A. Watson, C.B.E. (General Manager, Lancashire and Yorkshire Railway), Hon. Local Secretaries. Local headquarters: Corporation Tramway Offices, 55, Piccadilly, Manchester.

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A Bohemian Concert—the second of the season—was given by the Male Voice Choir in the Hamilton Hall of the Great Eastern Railway Hotel on December 1, before a crowded audience. Lady Ellis, the wife of Sir Charles Ellis, a director of the company, was in the Chair, and in a very pleasing speech responded to a vote of thanks accorded her on the motion of Mr. Kenneth Foster. As a souvenir of the occasion she was presented with an ivory and silver mallet suitably inscribed. The concert was conducted by Colonel William Johnson Galloway with his customary ability. On December 4, the Society's orchestra and combined male voice choirs from London, Ipswich, Cambridge and Norwich, gave a concert in the Guildhall, Cambridge, before a crowded and enthusiastic audience. The choir and orchestra were in best form, and their efforts evoked the highest appreciation.

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In no walk in life is the old adage "prevention is better than cure" more applicable than in railwaydom. Railway men, however. become so familiar with danger that a reminder of the risks of their calling is more than often opportune. A very handy 40-page booklet entitled "Hints to Avoid Injury" has just been issued by the Lancashire and Yorkshire Railway. Mr. Arthur Watson, the company's general manager, in the preface points out that many of the accidents to the staff are due to simple causes, and while some mishaps are accidental, a number are the result of carelessness, whilst others are due to the taking of unnecessary risks. The book in question, usefully illustrated, is replete with excellent advice and should be carefully studied by railwaymen of all grades and in all phases of railway employment. We trust that a reduction in the number of staff-accidents on the Lancashire and Yorkshire Railway will be the result of the issue of this very comprehensive booklet.

* * *

The Canadian Pacific Railway, 62, Charing Cross, London, S.W.1, has just issued an interesting illustrated handbook entitled "Education in Canada." Compiled by Miss Florence B. Low, it contains many charming descriptions of Canadian school life and a wealth of information respecting the educational facilities existing throughout the Dominion—from the palatial McGill University to the tiny prairie school-house shack with its accommodation for nine or a dozen children, who mostly ride or drive to school and house their steeds in the stables provided for that purpose. The book also includes particulars of the salaries paid and deals with the openings that exist for British teachers in Canada and indicates the conditions under which those trained in the British Isles may secure recognition in the Dominion. The handbook may be obtained free on application.

* * *

At a recent staff "Efficiency" meeting, Mr. C. J. Spencer, O.B.E., Manager, Metropolitan Electric, London United and South Metropolitan Electric Tramways, gave a lecture entitled "A Transport Man's Visit to America." This paper, dealing principally with surface transport in New York and other great American cities, proved exceedingly interesting, and was thoroughly appreciated by a representative gathering of some 300 of the supervisory grades of the Underground Railway and London General Omnibus Company.

* * *

The Lancashire and Yorkshire Railway has always been in the forefront of those companies who have given attention to the education of their employees. Having in mind the success which has attended the School of Signalling, Mr. Ashton Davies, Superintendent of the Line, has arranged for a series of lectures dealing with the clerical work of the Commercial Section of the Coaching Department. The opening Lectures were given on November 22, at Manchester and Preston. At the former place the Lecture was given by Mr. D. Price, Office of Superintendent of the Line, the Chairman being Mr. Geo. Hawkins, Assistant to Superintendent of the Line, whilst at Preston the Lecture was given by Mr. G. Dowding, Office of Superintendent of the Line, Mr. F. J. Neele, District Passenger Superintendent, presiding. The Lecturers dealt very fully with the question of the Labelling, Packing and General Regulations governing the acceptance of traffic, and subsequently it is proposed to cover every branch of Parcels and Booking Office routine such as :—

Owners' and Limited Risk Agreements and Consignment Notes.

Rates and Charges for all description of traffic carried by Passenger Train.

Insurance.

Recording of Forwarded Traffic.

Recording of Received Traffic.

Contracts for Mails, Newspapers, &c.

Accompanied Traffic.

Left and Lost Luggage.

Compilation of Parcels Accounts, Summaries, Balance Sheets, &c.

Claims.

Booking Office Equipment, Accountancy, Returns and Summaries, and General Matters.

A large number of students have been enrolled and for the sake of convenience classes are being held at other centres to enable the staff to travel from the stations at which they are employed. No expense whatever is incurred by the students, and periodically there will be examinations and prizes awarded to those attaining a certain standard of merit.

* * *

One of the most active sections of the London "Safety First" Council is that which represents railways. The Railway "Safety" Committee, as it is called, recently reported that considerable progress had been made with the competition for the children of railway employees; that upwards of 10,000 condition leaflets and entry forms had been distributed, and wide publicity accorded by the general Press and Official organs of railway companies. Also that arrangements had been made for adjudication of the essays to be received. The members of the committee are Mr. G. H. Dennis (L.B. and S.C.R.) Mr. H. E. Blain, C.B.E. (Underground), Mr. F. W. Hopper (S.E. and C.R.), Mr. J. P.

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Thomas (London Electric), Mr. J. Thornton (Central London).

* * *

By a statement issued by the Ministry of Transport it is shown that the financial results of working the controlled railways in the United Kingdom for the month of October, 1920, resulted in a net Government liability for the month of £4,936,906, due to the falling off in receipts consequent upon the miners' strike. November results are similarly affected.

* * *

In addition to providing a most convenient and direct means of reaching the recent successful International Advertising Exhibition at the White City by means of their station inside the grounds, the Metropolitan Railway exhibited a specially constructed full-size section of their electric rolling-stock, effectively demonstrating, on the one hand, the luxury and comfort of present-day travel and, at the same time, forcibly bringing home to potential advertisers the high standard, incomparable value and paying certainty of electric railway carriage advertising. The car, which was brilliantly lighted and advantageously placed, was visited by thousands of visitors and further constituted a record in rapid construction, it having been made and erected at the Birmingham plant of the Metropolitan Carriage, Wagon and Finance Company in the brief period of 10 days.

THE METROPOLITAN RAILWAY'S EXHIBIT AT WHITE CITY.

* * *

In the House of Commons, on December 1, Mr. Neal, in answer to Mr. Briant, said: The position of the Irish railways in consequence of the refusal of the railwaymen to handle certain Government traffic grows increasingly acute. Passenger and goods trains have ceased to run on the undermentioned sections:—Great Southern and Western Railway: Limerick to Waterford, Limerick to Tralee, Ballingrave Junction to Foynes, Patrickswell to Charleville, Killonan to Nenagh, Birdhill to Killaloe, Clare to Banagher. Cork, Bandon and South Coast Railway: Kinsale Junction to Kinsale, Clonakilty Junction to Clonakilty. Ballinascarthy and Timoleague Railway and Timoleague and Courtmacsherry Extension Railway: Ballinascarthy to Courtmacsherry. Great Northern (Ireland) Railway: Dundalk to Enniskillen, Inniskeen to Carrickmacross, Ballybay to Cootehill, Ballyhaize to Belturbet, Bundoran Junction to Bundoran. Londonderry, Lough Swilly and Letterkenny Railway: Tooban Junction to Burtonport, Buncrana to Cardonagh. Passenger services have ceased to run on the undermentioned systems or sections, but a goods service is maintained, in almost every case a reduction from the normal, and in some cases a reduction of considerable magnitude:—Great Southern and Western Railway: Roscrea to Nenagh, Kildare to Kilkenny via Carlow, Limerick to Sligo, Mallow to Tralee. Midland Great Western Railway: Athlone to Achill, Manulla Junction to Killala. Cork, Bandon and South Coast Railway: Drimoleague Junction to Bantry, Cork to Skibbereen. Cork and Macroom Direct Railway, Cork and Muskerry Light Railway and Donoughmore Extension. Tralee and Dingle Railway and West and South Clare Railways. The following systems or sections have been affected, but a passenger and goods service has been maintained with varying degrees of reduction from the normal:—Great Southern and Western Railway: Tralee and Valentia Harbour, Roscrea to Birr, Maryborough to Waterford; Ballina to Tullow, Mallow to Waterford, Waterford to Wexford and Rosslare Harbour, Clonmel to Thurles, Kingsbridge to Cork. Midland Great Western Railway: Broadstone to Clifden Mullingar to Sligo, Inny Junction to Cavan, Clonsilla to Kingscourt, Edenderry Branch, Killeshandra Branch, Athboy Branch, Ballinrobe Branch. Londonderry and Lough Swilly Railway: Londonderry to Buncrana. Listowel and Ballybunion Railway.

* * *

A "London Traffic Talk" was given recently by Mr. H. E. Blain, of the London Underground Railways, before members of

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the United Wards' Club, at Cannon Street Hotel. Mr. Blain showed how great had been the growth of metropolitan traffic, especially in recent years, and said London was now the greatest riding city in the world, having outstripped New York, which formerly held the record. Speaking of the improvements recently effected in motor-omnibuses, he said that a type of vehicle which would shortly be seen upon the streets, in numbers that would rapidly increase, would undoubtedly revolutionise omnibus traffic and would probably considerably affect the trams.

* * *

A NEW subway was opened under Charing Cross Railway Station (Underground) on December 6, to relieve the congestion of traffic caused by the clash of people who are going down and people who are going up. As about 130,000 passengers per day use the communications between the District Railway and the Tubes at this station the convenience of causing each stream of traffic to flow in one direction is obvious. The engineering work involved was interesting. The roof of the new subway is only 18 in. below the level of the rails, and the floor is below the level of the subsoil water. To meet this double difficulty the ceiling is made of asbestos sheeting, packed with slag wool to deaden the noise of the trains; and the foundation is a cast-iron tank. Fifteen men did the work, with 80 trains an hour rattling and roaring above them. The cost of the subway, which is 60 ft. long, was about £12,000.

* * *

ON the North Staffordshire Railway four new 0–4–4 passenger tank engines have recently been completed at the Stoke Works. They are similar to the 1907–8 engines of the same type, with the exception that larger bunkers have been provided. The numbers of these engines are: 15, 17, 19 and 54. The old engines which bore these numbers are now on the "A" list. During the period 1914–19 two new classes of 0–6–4 tank engines were constructed at Stoke, as follows: "New C" class (5 ft.), Nos. 4, 5, 30, 31, 53, 70, 173 and 174; "F" class (5 ft. 6 in.), Nos. 114–121 inclusive.

* * *

CONCERNING London and North Western Railway locomotives, Mr. C. Williams writes:—Nos. 1092, 1096, 1097 and 1133 are the latest new engines of the four-cylinder "Claughton" class to be turned out at Crewe. These complete the batch mentioned on page 361 of the November issue. A new series of similar type will shortly be put in hand. No. 1934, "Blenheim," a "Jubilee" class four-cylinder compound, has been converted to "Renown" class (two-cylinder simple), while No. 1241, a four-cylinder compound mineral engine, has been simplified and superheated. No. 1286, a two-cylinder 0–8–0 (formerly four-cylinder compound), has been superheated. Another of the 0–6–2 passenger tank engines has been fitted for motor service, viz., No 16. The following table (corrected to November 1) gives the remaining four-cylinder compounds and their classes, with the number of each class:—

4–4–0	"Alfred the Great"	26
4–4–0	"Jubilee"	19
0–8–0	Mineral	85
2–8–0	do. (Large Boiler)	12
2–8–0	do. (Small Boiler)	19
	Total	161

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IN view of the interest taken by various readers in the four once well-known Great Western Railway 4-4-0 locomotives No. 7, *Armstrong*, No. 8 *Gooch*, 4,169 *Brunel*, and 4.170, *Charles Saunders*, reference to a letter from Mr. W. N. Parry, of Wolverhampton, will be in place. He mentions that some months ago he saw all four of these engines outside Stafford Road sheds awaiting attention. *Brunel* was first dealt with, but has not been seen since it left the shops. *Charles Saunders* has lately been working in the Wolverhampton district. More recently *Gooch* has been back at work again, and *Armstrong* is apparently next to receive shop attention.

* * *

AT the official opening of a further section of the North Coast railway line in Queensland recently, the Minister for Railways made an interesting announcement on the Queensland Government's railway policy. The new section was from Styx River to Wumalgi, and after referring to the advantages which would accrue from the completion of the whole coastal line, the Minister said it was estimated that the section to Mackay would be opened in August next year, to Townsville in March, 1922, and Cairns 1923, which would enable passengers to travel right through from Perth to Cairns, over 4,000 miles. He touched on the difficulties which had been experienced in securing rails and cement, and stated that of the total distance of 645 miles from Rockhampton 58 miles had been constructed before the construction of the North Coast line had been commenced. Since then 263 miles had been constructed and 119 miles of tramways taken over, and 205 remain to be built. The total cost of the railway to date was £2,500,000, and the estimated cost to complete the line was £13,000,000. With the

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opening of a section on the Mackay end to Carmilla Creek they would then have 5,700 miles of railway in Queensland. They had invested £45,700,000 in railways. The revenue of last year was £4,935,600, an increase of £953,000 on the previous year. In referring to what he termed unfair criticism levelled at the railway department, Mr. Larcombe said it had been stated that the department had shown a deficit during the last two or three years. He wanted to remind them that before the present Government came into power, the accumulated deficit on the railway service was £8,000,000. He wanted to remind them that other States of smaller area and larger population like Victoria had also had railway deficits. With a railway department there were other features besides making profits. It was an excellent thing to balance the ledger and the railway department was constantly endeavouring to do this, but there were other factors more important than balancing the ledger. They wanted to fully and suitably develop this great State, and to prevent a constant rush to the cities. They wanted people to go out and take up land and increase wealth and production; but if they were to increase fares and freights every time the ledger did not balance, they were not going to discharge this important responsibility. The main lines of Queensland had paid exceedingly well. The deficiency was in the agricultural lines.

* * *

A MEETING of the Institution of Locomotive Inspectors and Foremen was held at Victoria Station, London, on November 27, and, after the usual business, Mr. R. P. C. Sanderson, M.I.L.E., of the Baldwin Locomotive Works, read a paper on "Electric Welding in Locomotive Manufacture," which proved most interesting and a good discussion taking place. Mr. Sanderson exhibited a large number of photographs of the welding taking place; also brought a number of pieces of metal which had been welded for inspection.

* * *

LONDON, BRIGHTON AND SOUTH COAST RAILWAY services to and from all parts of the Continent, via Newhaven and Dieppe, are now running regularly, from London (Victoria Station) or Paris (St. Lazare) at 10 a.m. every week-day and Sunday. The Channel services are maintained by the fine turbine steamers *Paris, Rouen, Newhaven, Dieppe and Brighton*, which make the journey in about 3¼ hours. Through fares and baggage rates are in operation between London and the most important holiday centres in Switzerland and the Swiss health resorts have organised every description of winter sports which are increasingly popular with British travellers.

* * *

THE "Brighton in an Hour" Pullman train, "The Southern Belle," which performs the journey between Victoria and Brighton in 60 minutes, is regaining its old-time popularity. During the war this train was suspended, but now it again makes two journeys between London and Brighton daily within the hour. This train of Pullman Cars first performed the journey from London to Brighton in 60 minutes in October, 1899. It was then known as "The Brighton, Limited" train, but in 1908 a new train of luxurious Pullman Cars with all the latest improvements was specially built for this service and to it was given the name of "The Southern Belle."

* * *

OWING to high wages and the price of coal, and the small number of passengers travelling on the Furness Railway's Windermere Lake steamers last year in the winter, the running of these boats has been suspended during the present winter, and motor 'buses have been put into service between Lake Side and Ambleside. The running of these motor 'buses is experimental, and possibly additional roadside traffic will be picked up.

* * *

AT the December general meeting of the members of the Railway Club, 65, Belgrave Road, S.W. 1, Mr. Edwin J. Miller gave an excellent lantern lecture on "The Electric Underground Railways of Paris." A lantern lecture on "The Development of the Modern British Express Locomotive," will be given by Mr. R. L. Burge on January 14. On Friday evening, February 11, Mr. H. L. Hopwood is to present his paper, entitled "Ten Years' Progress at Doncaster Works, Great Northern Railway." RAILWAY MAGAZINE readers desirous of joining the club in the New Year should now make application to the hon. secretary.

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THE RAILWAY MAGAZINE.

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H. A. WALKER, General Manager.

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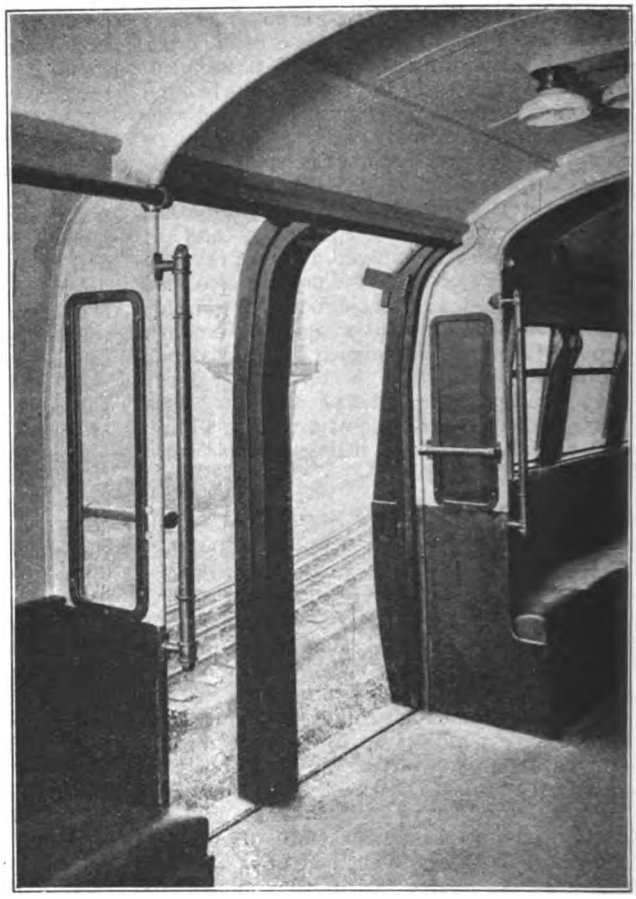
one to which no white board is attached, "he is to *return slowly with his train to the nearest signal box behind him*, and find out what is the cause of the delay." The italics are ours, but one can imagine the situation should drivers act as suggested, especially should another train behind it be waiting at a signal *in advance* of the box by which it is controlled, but which is the "nearest signal box behind" as regards the former train. Presumably, however, the second train would also back, and in the case of a serious delay a whole series would be similarly moving the wrong way, more or less at cross-purposes.

But "Quex" crowns his first blunder, which is perhaps excusable in some degree, by the comment that "the benefits accruing from this system seem small in comparison with the cost of fitting hundreds of signals with the boards!" A few pounds would pay for a hundred or more, including cost of fitting; but surely the writer of this nonsense must have realised that although he may not understand it, there must have been some more substantial purpose, the cost of the boards being relatively insignificant.



NEW ROLLING-STOCK, LONDON ELECTRIC RAILWAY.

Inside View showing Double Middle Doors Open.

New Rolling-Stock, London Electric Railway.

FORTY new cars constructed by Cammell Laird & Co., are being delivered for service on the "Piccadilly" section of the London Electric Railway. Each car accommodates 44 seated passengers, and while there is good standing space, there will be no strap-hanging—in the literal sense of that term. Straps are replaced by hand-poles, both vertical and horizontal, within convenient reach of any passenger who may be obliged to stand. The length of the new cars is 50 ft. overall.

The door arrangements are a special feature of the new stock. In contrast to the older stock, each car has a pair of middle doors instead of double doors, and two single end sliding doors, giving much greater facility of entrance and exit. These doors are operated by air, with electrical control, so devised that, if a door in closing comes in contact with a passenger, its action is reversed at once, so that there is no possibility of entanglement. Moreover, the train cannot start until every door is closed. The passenger is thus fully safeguarded against injury or accident, while the processes of entering or alighting are considerably expedited.

Above the waist of the car, the interior is painted in cream colour, so as to give an even better reflecting surface than hitherto. An elliptical roof replaces the clerestory roof of the older stock, and roof advertisements will be restricted so as to give more light-reflection. Electric lamps run down the centre of the roof for the whole length of the car. Emergency lighting is supplied from a storage battery, and comes into operation automatically in the event of any failure of the ordinary car-lighting. Total cost of the 40 new cars will be approximately £120,000.

The new rolling-stock will relieve congestion in the first place by expediting the

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working of the trains, and it will also enable a 6-car train service to be built up, as each new train replaces and releases a 5-car train of the older stock. These older 5-car trains can then be divided, as the new trains come into working, and added, car by car, to other 5-car trains of the older stock to make them into 6-car trains. This will mean an all-round strengthening of the services, and an all-round lightening of the overload. The 40 new cars will mean an actual addition of more than 26 per cent. to the existing car-strength of the "Piccadilly" line, and an equivalent relief of the "rush-hour" pressure, representing a total gain of 1,760 seats.

The new cars are already being delivered, and several sets will shortly be in service. It is expected that the first of 100 new Metropolitan District cars with three equally spaced double doors on each side, for use in 8-car trains, will shortly be running.

The Fixing of a Fare.

UNDER this title Mr. Frank Pick, Commercial Manager to the London "Underground" Companies, recently addressed the London School of Economics, and in the course of his paper brought forward several important considerations which are not fully realised. In regard to statutory enactments concerning fares, he pointed out that the London Electric Railways (Fares, &c.) Act, 1920, establishes a maximum of 1½d. a mile for ordinary fares, with a minimum of 2d. "The notion underlying it is that the railways are not subject to competition, and therefore the economic factor is inoperative to prevent excessive fares. A false notion twice over. First, because there is omnibus competition. Secondly, because without competition the economic factor remains operative." From this he proceeded to set forth various geographical influences, and the effect which the location of industry has upon residence. This led up to reference to the first omnibuses, and the flat rate fare. "The first omnibus appeared on the scene in 1829, running from the 'Yorkshire Stingo,' in Paddington, to the Bank, for a fare of 1s., including the free use of a newspaper. The first railway entered London in 1837. The first underground opened in 1863. The celebrated penny-a-mile era had dawned. A scheme of fares must stimulate growth. This idea is at the bottom of the flat fare schemes of the mushroom-like American cities. The American flat fare dies hardly. Rather than give it up all sorts of higher flat fares are being tried, *e.g.*, 10 cents in 69 cities, 9 cents in 2, 8 cents in 30, 7 cents in 171, and 6 cents in 149. But there must be a point at which the flat fare scheme is impossible. The street railways of Berlin have tried successively a 30 pf., 50 pf., and 70 pf. (nominally 4d., 6d., and 9d.) flat fare and have continuously failed to secure a revenue adequate to pay their operating expenses. The fares simply killed the traffic. London's own experiment in the flat fare, on the 'Twopenny Tube,' does not furnish anything conclusive as to the merits or demerits of flat *versus* differential fares schemes for London."

First-Class Passengers and Travel Psychology.

Mr. Pick then commented upon the fact that a first-class fare is really extra consideration for a less dense traffic, and if passengers did not take first-class tickets the "Underground" would not retain first-class carriages. If there is to be any limit to London's growth, that limit will be economic and expressed in a fare. People will continue to be drawn into London until it is impossible for them to live on their incomes within its orbit comfortably. The fare between the centre and the outermost suburb will mark the breaking point.

"The more interesting bearings of psychology relate to the individual. A good fare fixer must understand the animal—man. Man wants things cheap, and woman more so. If there is one thing they both want cheap it is their rides. On this account the cost of travel must always be cheap in comparison with the general level of prices current. The price of a reel of cotton may soar from 2½d. to 10½d., and only provoke a grumble but if the price of a ride goes from 3d. to 4d. the passenger at once tries to cut the length of his ride to save the difference. Postage stamps, newspapers, matches may double in price but the bit on the fare is always the last straw. Even more than he wants his fares cheap, man wants them equitable. The Underground has spent a great deal both of money and pains in advertising to the public with the one object of persuading all that its fares were right.

Effect of Fares on Traffic.

"From 1906 down to the opening of the war in 1914, Underground fares were gradually lowered, so long as the volume of passengers to be carried would respond and yield a better final result. Our railway passengers went up from 167 millions to 249 millions in the period, while, in spite of extensions adding to the length of journey, the average receipt per passenger went down from 1.86d. to 1.76d. That is the policy which has excited the Londoner—man, woman, and child—to take over 400 journeys on the average this year. In the anguage of economics, it is a case of testing by progressive production in fares what is the

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marginal demand. The doctrine of charging 'what the traffic will bear' is not founded on a simple supply and demand principle. Underground railway traffics sprang from 300 to 400 millions in three years. The extraordinary traffics which got us into severe disfavour for congestion were, probably, the consequence of our own mistake in not keeping our fares in harmony with the cost of living. The recent increase in fares relieved us of 10 per cent. of our passengers, although our total rise in price namely, 73 per cent., was less than half that of the cost of living as officially calculated.

"Fares can only be fixed by patient research and hard work with accounts and statistics. You must bring to them imaginative treatment. Cost must cover working expenses and outgoings of every sort, a full allowance for depreciation and renewals, and such a return on capital as will sustain the credit of the undertaking. Until that is met there is no real profit. Urban transportation has been consistently sold below cost, and we have reached a stage at which there is no further progress until we are fully solvent."

The Importance of Signalling.

ADDRESSING the graduates and students of the Institute of Transport on Friday, December 3, Mr. Ashton Davies, M.B.E., Superintendent of the Line, Lancashire and Yorkshire Railway, emphasised the importance of "signalling," which he defined as including (1) The signals provided to control the movement of trains, *i.e.*, fixed, hand and detonating signals; (2) the provision of signal boxes and ground frames, with their equipment, including lever frames, locking arrangements and electrical instruments; (3) The Rules and Regulations and instructions applicable in carrying out traffic movements in connection with the use of the installations referred to under (1) and (2).

Fixed signals he placed in two classes: running and subsidiary; the former comprises distant, home and starting signals, and the latter the signals for slower movements, such as siding, shunting, backing, and calling-on, &c., signals. The most important of the running signals is the distant.

The question of simplifying the signalling in short sections has been given considerable attention, and, in the view of some signalling experts, the opinion has been formed that the time has arrived when mechanical or electrical means should be provided which would prevent the distant signal, in the case of short sections, being lowered unless the necessary clearance is available. This condition could be arrived at by providing, say, one distant signal in connection with two signal boxes, and it should not be possible for the distant signal which would apply to the home signals at "A" and "B" boxes to be lowered unless the whole of the stop signals for both "A" and "B" boxes are at the "All right" position, and the arrangements should be such that the signalman at either "A" or "B" could place the distant signal to the "danger" position after it has been lowered if the conditions justified this course being adopted

Permissive Block Working and Hammer-headed signals.

AFTER describing the various types of signals and appliances in detail and reviewing the principal rules and regulations in force, emphasising the fact that only by adequate signalling can traffic be worked during the busy hours at large stations such as Manchester (Victoria), Mr. Ashton Davies referred to special methods, and we may extract from his remarks particulars of certain features of permissive working.

On a section of a railway where the running of passenger trains ceases at, say, 11 p.m. until about 4.30 the next morning, and the goods train traffic is considerable, the workings can and have been expedited by putting into force an arrangement which allows of special permissive signalling instructions being put into operation over running lines during the hours passenger trains are not running. This principle has been further extended to points where, during certain hours of the day, a line is used as a passenger line under the absolute block system, and as a goods line under the permissive system; a good illustration of this is between Thornhill (Midland Junction) and Healey Mills West on the Down North Line, where absolute block is worked for passenger trains and such trains are only allowed to enter the section if the starting signal is lowered, whereas permissive working is authorised for trains other than passenger trains, and a second train may enter the section under the permission regulations provided a special signal (known as the Hammer-headed type) is lowered.

A driver working a passenger train is not authorised to enter the section except by the lowering of the starting signal, whereas the driver working a goods train can enter by the lowering of the hammer-headed signal. This section of line is just in rear of the Marshalling Sidings at Healey Mills, and the arrangement allows of five or six trains following each other to be cleared from the running lines in a short interval of time by placing three of them in the three arrival lines and allowing the remainder to stand behind each other on the Down North Line between Midland Junction and Healey Mills

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West, whereas but for this system of working between Thornhill (Midland Junction) and Healey Mills West, only one train would be able to stand between those Boxes, and the other two would be obstructing sections in rear.

There is a Junction between the North and South Lines at Thornhill (Midland Junction) which allows of trains being turned from the North to the South line past the standing trains, and such a facility is of great assistance in expediting traffic operations.

Reversible Working on the Lancashire & Yorkshire Railway.

In this connection Mr. Ashton Davies provided interesting particulars of arrangements in force between Fazakerley West and Aintree where signalling arrangements and instructions have been put into force which allow of the Up and Down lines being used for running in either direction. For instance, traffic proceeding into Aintree Sorting Sidings and travelling along the Down line from Fazakerley to West Aintree, obstructed the movement of coal from Fazakerley Sidings to the Depôts, whereas now by running the latter trains over what would be the up Line in the Down direction, the two operations do not clash, and give practically the effect of a widening, either line being converted into an Up or a Down Line as may be desired. The general principle of Block working is still maintained, as there can only be one train in the section on the same line at the same time, and when permission has been given for a train to travel in the down direction, the locking and signalling arrangements are such that it is not possible to lower the signals or give permission for a train to travel in the reverse direction. It will, therefore, be seen that the extension of this principle can have far-reaching effects in speeding up operations at different places on the line.

Interlocking Block.

THE system of Interlocking Block put into force on one railway is so arranged that the signal controlling the entrance of trains into the advance section cannot be lowered unless the "Train out of Section" Signal has been given for the previous train, the Home Signal at the Signal Box in advance after being lowered having been placed to "Danger" and the "Line Clear" indication given on the block instrument for the next train.

In the event of a train being brought to a stand at the Home Signal at the Signal Box in advance, and being detained there, the pressing of a plunger provided on the signal post, locks the commutator of the block instrument at the "Train on Line" position, and prevents the indicator being placed to the normal position until the Home Signal has been lowered and placed to the "Danger" position. Such an arrangement is also a good one in the case of parallel lines where a signalman may signal a train, say, on the Up South Line and get it accepted on that line but have the points set for the Up North Line, which may be obstructed, and lower the signals for that line in error.

Mr. Ashton Davies dealt very fully with various traffic aspects, notably goods train control, &c., but unfortunately space will not permit of reference to the many other interesting points which he raised.

Railway Progress in the Malay States.

THERE has just come to hand the report of Mr. P. A. Anthony, C.M.G., General Manager and Chief Engineer, on the working of the railways in British Malaya in 1919. The year under review is the first complete post-war period, and it is therefore not surprising that marked increases appear in practically all the revenue-producing transactions of the railway, but the accompanying increases in expenditure, occasioned by the enormously enhanced cost of materials and higher wages and allowances, outweigh the increases in earnings. There was every indication at the close of the year of still higher working costs in 1920, and Mr. Anthony is of opinion that an increase in goods rates and terminal charges appears inevitable if the railways are to be maintained on a paying basis.

The working for 1919 (after providing for a contribution of £42,104 to the Imperial Government for war purposes) produced a net profit of £386,218 compared with £396,591 in 1918, representing 2·67 per cent. on the total capital expenditure, as against 3·12 per cent. in 1918. Train services in connection with the Siamese Royal State Railways, inaugurated on July 1, 1918, have enabled a considerable traffic, both passenger and goods, to be developed between the two countries. The passenger service over the Siamese Railways is on alternate days, and the time occupied between Bangkok and Singapore is four days (or three days from Penang to Bangkok). It is hoped that this will be accelerated in the near future by the running of express trains over the Siamese system.

A considerable amount of new constructional work is in progress, and trial surveys have been made of possible new lines and deviations, a programme which will entail considerable expenditure during the next few years. The Pahang Section of the East Coast Railway, already open over 141 miles, will be extended to the border of Kelantan (70 miles); the Kelantan section from Tumpat to the Pahang border will be

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108 miles in length, of which 32 miles are already open to traffic; while work has been begun on the section (11¾ miles) to connect northward with the Siamese system at Rantau Panjang. When the East Coast Railway is completed, travellers will have an alternative route from Singapore to Bangkok.

Messrs. Topham, Jones and Railton are the contractors for the extensive railway works at Prai, in Wellesley Province, opposite the island of Penang, which will be an important terminus; and the same contractors are carrying out the construction of a causeway connecting the island of Singapore with the mainland at Johore Bahru. The time allowed for this latter work, which will carry a double line of rails as well as a roadway suitable for motor traffic, is 5½ years.

The Future of the Home Railways.

A LETTER addressed by Viscount Churchill, as Chairman of the Railway Companies' Association, to Sir Eric Geddes, Minister of Transport, has done much to clear the air, as it sets forth the views of the Association in regard to the Government proposals. Moreover, while in many respects the criticisms advanced are destructive, there is also a great deal of valuable constructive suggestion. Indeed, in many respects the arguments adduced appear to be of distinct and tangible value as compared with the vague outline yet vouchsafed on the Government side. The principal points raised will be generally familiar to our readers, except that many of the partisan newspapers have quoted certain portions only, thereby tending to create erroneous or biassed impressions.

In regard to grouping, and it is not clear whether the Government proposes actual amalgamations or grouping for collective operation, the scheme so far outlined is not considered satisfactory. It is suggested that amalgamation of capital should be optional and not compulsory, while the following grouping would be more equitable financially:—

Group No. 1.—London and North Western, Midland, Lancashire and Yorkshire, North Staffordshire, Furness, Caledonian, Glasgow and South Western, Highland.

Group No. 2.—Great Central, Great Northern, Great Eastern, Hull and Barnsley, North Eastern, North British, Great North of Scotland.

Group No. 3.—Great Western and Welsh lines.

Group No. 4.—London and South Western, London, Brighton, and South Coast, South Eastern and Chatham.

Group No. 5.—London Railways (local lines).

This was dissented from by representatives of the North Eastern, Hull and Barnsley, and Barry Railways.

Strong objection was raised to the appointment of representatives of the workers to the boards of directors, and the proposals therefor are regarded as "quite unjustifiable and wrong in principle, and from every point of view objectionable." One effect, it is pointed out, might be to place a servant occupying a subordinate position in authority for the time being, over his official chief. It is thought, however, that the desired beneficial objects can equally well be secured by the appointment of a committee or committees composed of:—

(*a*) Officers to be nominated by the Board;

(*b*) Workers to be elected by and from among the workers, either sectionally or generally, and in such proportion as may be thought advisable;

(*c*) A secretary appointed by the Board; these committees to meet under the chairmanship of a director to consider and make recommendations to the Board.

Financial aspects are discussed at considerable length. Owing to the vagueness of the provisions so far set forth, and the fact that the railway companies can hardly know their actual positions until the anticipated Transport Act becomes law, which may be in June or July next, while the present situation is to terminate in August, it is suggested that the grouping scheme, whatever its form, should not operate until January 1, 1924, and that the Government guarantee should be continued until then, otherwise the railways must operate as separate entities, as in pre-war days, during the intervening period.

Objection was also raised to the claim by the Government in regard to powers of future control, which would, in effect, place the railways under the management of the Ministry of Transport, while nominally returning them to private ownership. Also to proposals to control capital and that the State should share in surplus revenue for general development. It is pointed out in detail that many of the claims advanced cannot be supported either as reasonable or in law, while there is already in existence sufficient legal control upon railway companies to ensure the public being fairly treated and to avoid unjustifiable charges being made, &c. The whole of the letter is, indeed, a well reasoned statement of the railway companies' position.

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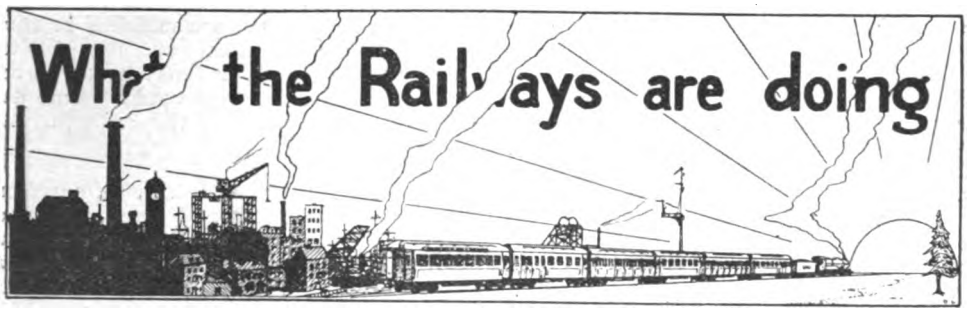

As we go to press it is officially announced that Sir Thomas Williams, General Manager of the London and North Western Railway, retires at the end of 1920, and joins the board, and that Mr. Arthur Watson, C.B.E., the General Manager of the Lancashire and Yorkshire Railway, has been appointed as his successor, and in agreement with the boards of both companies and in their joint interest is to continue as General Manager of the Lancashire and Yorkshire Railway.

* * *

Col. J. S. Dennis, C.M.G., who recently arrived in London, is the Chief Commissioner of Colonization and Development of the Canadian Pacific Railway. He is one of the best-known "old-timers" who have established a prosperous and well-settled Western Canada, having been identified with the development of that great region since 1872—first with the Hudson's Bay Company, then as Inspector of Surveys for the Canadian Government, Deputy Minister of Public Works in the old North-West Territorial Government and, later, as Assistant to the President of the Canadian Pacific Railway. During his connection with the last-named Company, which dates from 1902, he has been responsible for the creation in Southern Alberta of the largest individual irrigation project in America. For many years he has been in charge of the Immigration and Land Settlement policy of the Canadian Pacific, which has been the means of settling hundreds of thousands of British, American and Canadian farmers upon the Western Provinces and amongst the notable schemes that he inaugurated, of especial interest to the British emigrant, is the "Ready-Made Farm" idea. Colonel Dennis has also had considerable military experience dating from the Riel Rebellion in 1885. During the war he was second in command of the British Canadian Recruiting Mission in the United States, which was instrumental in recruiting over 30,000 British citizens, resident in the United States, for the British and Canadian Forces. In 1918 he went to Siberia with the Canadian Expeditionary Force, in charge of lines of communication, transportation, accommodation and general information. He commanded, in addition, the Red Cross Expedition to Siberia, as Commissioner, and was Chairman of the Canadian Trade, Commission at Vladivostock.

COL. J. S. DENNIS, C.M.G.,
Canadian Pacific Railway.

* * *

An interesting event took place at Amiens Street Station, Dublin, on December 10. Mr. Sam Berkeley, Assistant Superintendent of the Great Northern (Ireland) Railway, recently resigned that service to take up an important appointment in connection with cross-Channel shipping now controlled by the Coast Lines, Limited, and his many friends and colleagues met for the purpose of making a presentation and wishing Mr. Berkeley success in his new position. The presentation took the form of a magnificent gold watch and chain, a Louis XV silver

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tea and coffee service, together with a cheque, the amount of which bore testimony to the popularity of the recipient. Mrs. Berkeley was also presented with a very fine gold watch-bracelet. In the unavoidable absence of the General Manager—Mr. John Bagwell—the chair was occupied by Mr. R. J. Moore, Superintendent of the Line. Mr. Berkeley joined the service of the Great Northern twenty-seven years ago, and few men of his years have had such a varied experience in railway work in Ireland. He served under three general managers—Messrs. Robertson, Plews and Bagwell. Six years as confidential assistant to the late Mr. Plews gave him a vast experience in matters of administration, and under Mr. Bagwell he got a further opportunity of a practical knowledge of out-door railway operations. Merit alone secured for him promotion to the position which he has just vacated, he was closely associated with the many improved workings recently carried out on the Great Northern Railway system, the services on which line are now second to none in the kingdom He is well known to the commercial public in Dublin and the North of Ireland as a courteous official, and many will regret his severance from the railway world. The shipping concern to which Mr. Berkeley has transferred his energies is to be congratulated on securing such a capable, courteous official, and he undoubtedly carries with him the heartiest congratulations and good wishes of his railway colleagues and many friends in commercial circles.

* * *

RETIREMENT from the railway service does not of necessity mean the relinquishing of the activities of life. A case in point is that of Mr. W. Sparks, who, after 46 years' association with the Great Western Railway, retired from the service nearly 10 years ago. Mr. Sparks, who was in November re-elected a Member of the Reading Town Council, will be remembered at Poplar, where he spent 17 years, leaving there in 1896 to take up the position of district goods manager at Gloucester. In 1902 he was transferred to Reading in a similar capacity and there remained until his retirement in June, 1911. His council work is much appreciated in Reading, and he has served upon an extraordinary number of committees. Since 1912 he has been a member of the Reading Board of Guardians, and a hard-working one at that. Church work, including the vice-chairmanship of the Greyfriar's Parochial Church Council, likewise has the advantage of Mr. Sparks' untiring energy. The offices mentioned by no means exhaust the list of Mr. Sparks' services for the commonweal, but are sufficient to show how very busy a practical and public-spirited "retired railway officer" may be kept when once he has decided to devote his time and abilities to the service of the community.

* * *

MR. T. M. WILLIAMS, C.B., retired from the position of Docks and Marine Manager on November 30, and the London and South Western Railway directors have appointed Mr. G. S. Szlumper, the Deputy Docks and Marine Manager, to succeed him.

* * *

MR. F. W. DINGLEY has been appointed, from December 1, Chief Locomotive Running Superintendent of the London and North Western Railway. Mr. Dingley has taken control of the Running Department, including locomotive steam sheds and outside shops. His office is at Crewe. Mr. Dingley comes of a railway stock, his great-grandfather having been a storeman for the firm of Messrs. Boulton and Watt; his grandfather was in the Locomotive Department of the Grand Junction Railway, and was subsequently transferred to Crewe as foreman of the erecting shops; whilst his father was shed foreman at Springs Branch Engine Shed. Mr. Dingley himself was assistant locomotive foreman at Willesden Shed, foreman at Bushbury, and foreman at Willesden. In 1909, he was made Assistant to the Chief Mechanical Engineer for the London Division, whence he was removed to Crewe to take the position of Motor Road Superintendent, which position he held until, in 1919, he was made outdoor Mechanical Superintendent, London and North Western Railway.

* * *

AT a meeting of the Board of the London, Brighton and South Coast Railway, on December 8, Mr. Charles Colin Macrae, the Deputy Chairman was elected Chairman of the Board in succession to the late Earl of Bessborough, and Lord Henry Nevill was elected Deputy Chairman.

* * *

We regret to record the death of Mr. Thomas Chellew Jenkin, a director of the City & South London Railway and formerly its general manager. Commencing with the South Devon Railway from which, after several years' service, he transferred to the Great Western Railway, Mr. Jenkin subsequently entered the service of the London, Tilbury & Southend Railway, and finally in 1890 was appointed General Manager of the City & South London Railway, some few months before the line was opened for passenger traffic.

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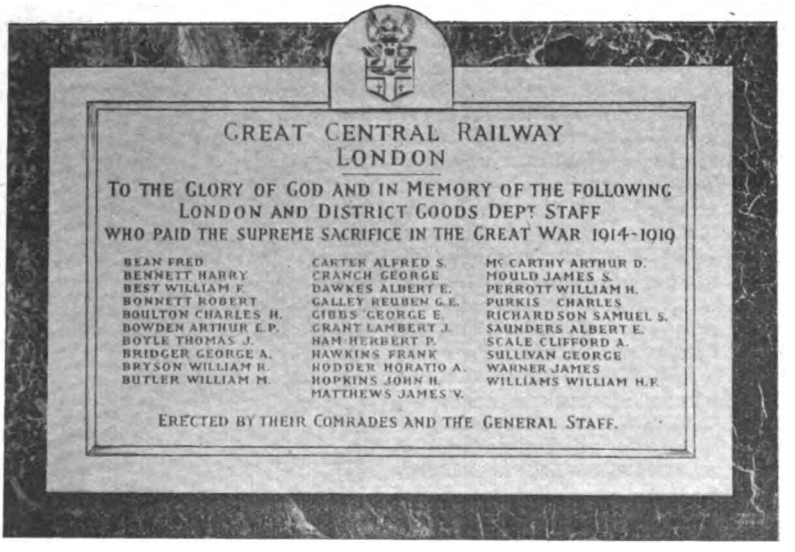
SIR SAM FAY, General Manager, Great Central Railway, recently unveiled a tablet "To the Memory of 31 Members of the London and District Goods Department Staff who made the Supreme Sacrifice in the Great War." Mr. G. Parsons, District Goods Manager, presided, and among the officers of the Great Central Railway present were Mr. D. H. Davies, Solicitor; Mr. J. Rostern, Chief Goods Manager; Mr. W. Clow, Superintendent of the Line; Mr. C. W. Neele, Electrical Engineer; Mr. A. Oldham, Assistant Superintendent of the Line; and Mr. E. Livesley, Assistant Goods Manager. The memorial is fixed on the wall of the main entrance to the Marylebone Goods Station. In a few well-chosen words Sir Sam alluded to the great sacrifice made by the men who had fallen, and said that the freedom we enjoyed to-day was solely due to them and their comrades "who died that we might live." He mentioned that 14 per cent. of those who joined the Forces from Marylebone Station had paid the supreme sacrifice. The cost of the memorial had been subscribed by the comrades of the men themselves and the general staff, and he thought it very fitting that this memorial, which was placed in such a prominent position, should be erected and the names of the men inscribed in marble, so that those who followed after would have some definite indication of the gallant men whose heroism they were commemorating that day. On concluding his speech, Sir Sam placed a beautiful wreath on the tablet.



GREAT CENTRAL RAILWAY WAR MEMORIAL.

WHEN the "Underground" group of London Electric Railways and its associates take in hand a staff function, nothing is too much trouble to ensure its success. The recent T.O.T. Concert at the Albert Hall was another triumph in organisation, as well as a musical success of no mean order. The T.O.T. Philharmonic Society, founded in January, 1920, is a development of the Grosvenor Road Choir, formed in 1916 and the "Victory Day" choir and bands which figured in 1919 at the welcome home to the 10,000 members of the staff returned from war service, given at the Royal Albert Hall. These efforts were so highly appreciated that the T.O.T. Philharmonic Society was inaugurated in January, 1920, with the Right Hon. Lord Ashfield as President, the inaugural concert being held in March at the Central Hall, Westminster, followed by another in the following month. An orchestra was added at the commencement of the present session, and the total membership of the Society is now: Choir, 400; bands, 110; orchestra, 60. An operatic and dramatic section has been organised and the first production is to be presented early in 1921. The keen support given by the directors and officers of the allied companies is proved by the presence at the Albert Hall concert of Lord George Hamilton, Viscount Knutsford, Lord Stuart of Wortley, Sir James Devonshire, Sir Alexander Roger, Sir L. Coward, Mr. H. A. Vernet, Mr. Murray Griffith, Mr. L. Robinson, Mr. G. Watson, and Lieut.-Col. W. Dumble,

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directors of the various associated companies; and the following officers: Messrs. H. E. Blain, C.B.E. (Operating Manager), Z. E. Knapp (Manager for Maintenance, Railways), G. J. Shave (Manager for Maintenance, 'Buses), F. Pick (Commercial Manager), G. J. Spencer (Manager, Tramways), J. B. Lindsay (Assistant Secretary), J. P. Thomas (Assistant Operating Manager), J. Thornton (Superintendent of the Line), A. R. Cooper (Engineer), W. A. Agnew (Mechanical Engineer), S. J. Webb (General Passenger Agent), Captain Rozier (General Superintendent, 'Buses), A. V. Mason (Engineer, Tramways), J. B. McKinnon (Superintendent, Tramways), J. C. Mitchell (Treasurer) and C. S. Touch (Accountant).

* * *

At the instance of the Newport Harbour Commissioners the Ministry of Transport recently held an inquiry in the Town Hall, Newport, Mon., with the following terms of reference:—

"To advise the Minister of Transport whether it is desirable in the national interest that the transport facilities and accommodation of the Newport Harbour should be improved or extended, and if so, in what direction they require improvement, and by whom should the improvement be effected."

Evidence was given on behalf of the Newport Harbour Commissioners in favour of the River Usk being developed in the national interest; but, although no definite schemes or estimates, financial or otherwise, were adduced, the broad view expressed on their behalf was in favour of a system of public wharves. Evidence in opposition was given on behalf of Guest, Keen and Nettlefolds, Limited; John Lysaght, Limited; The British Mannesmann Tube Company; The Newport and South Wales Steamship Company; Rennie, Ritchie and Newport Shipbuilding Company; The Ebbw Vale Steel, Iron and Coal Company, Limited. The Cardiff and Newport Patent Fuel Company; Happerfield and Willans; Partridge, Jones and Co., Limited; The Bristol Channel Dockowners' Association; and The Alexandra (Newport and South Wales) Docks and Railway Company. The case was also watched by representatives from the Great Western and Barry Railways. Put shortly, the contention of the opposition was that ample accommodation already exists, both for present traffic and the needs for some time to come, and that strong exception would be taken to any schemes which might result in increased dues for shipping using the harbour, or entailing an addition to the town's rates. Afterwards the Committee inspected the fine docks of the Alexandra Company, and were obviously much impressed with the ample and up-to-date character of the facilities provided.

* * *

The first congress of the Institute of Transport will be held at Manchester on Thursday and Friday, January 27 and 28, 1921. On the opening day, the proceedings, in addition to official functions, will comprise two sessions, at which papers will be read and discussed as follows:—*Morning Session*: "The Development of Mechanical Road Transport," by Mr. C. le M. Gosselin, Managing Director, H. Viney & Co., Limited, Preston. "Behind the Scenes in a Railway Locomotive Workshop," by Mr. J. W. Smith, Locomotive Works Manager, Great Central Railway, Gorton.—*Afternoon Session*: "Roads and Road Transport," by Mr. J. Cracroft Haller, County Surveyor, Nottinghamshire. "The Problem of the Canals," by Sir John Eaglesome, K.C.M.G., General Manager, Aire & Calder Navigation, Leeds. On the second day, a visit will be paid to the Manchester Ship Canal, by special invitation of the directors, and additional visits to places of interest in the vicinity will be arranged. The Congress will be open to all Corporate Members, Graduates and Students of the Institute. A complete programme will shortly be issued, together with forms to be exchanged for the requisite Congress ticket and cards of invitation to social functions. Secretariat: Mr. H. E. Blain, C.B.E. (Hon. Secretary of the Institute), Major H. Mattinson, R.E. (Civil Engineer, Manchester Tramways) and Mr. A. Watson, C.B.E. (General Manager, Lancashire and Yorkshire Railway), Hon. Local Secretaries. Local headquarters: Corporation Tramway Offices, 55, Piccadilly, Manchester.

* * *

A Bohemian Concert—the second of the season—was given by the Male Voice Choir in the Hamilton Hall of the Great Eastern Railway Hotel on December 1, before a crowded audience. Lady Ellis, the wife of Sir Charles Ellis, a director of the company, was in the Chair, and in a very pleasing speech responded to a vote of thanks accorded her on the motion of Mr. Kenneth Foster. As a souvenir of the occasion she was presented with an ivory and silver mallet suitably inscribed. The concert was conducted by Colonel William Johnson Galloway with his customary ability. On December 4, the Society's orchestra and combined male voice choirs from London, Ipswich, Cambridge and Norwich, gave a concert in the Guildhall, Cambridge, before a crowded and enthusiastic audience. The choir and orchestra were in best form, and their efforts evoked the highest appreciation.

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In no walk in life is the old adage "prevention is better than cure" more applicable than in railwaydom. Railway men, however, become so familiar with danger that a reminder of the risks of their calling is more than often opportune. A very handy 40-page booklet entitled "Hints to Avoid Injury" has just been issued by the Lancashire and Yorkshire Railway. Mr. Arthur Watson, the company's general manager, in the preface points out that many of the accidents to the staff are due to simple causes, and while some mishaps are accidental, a number are the result of carelessness, whilst others are due to the taking of unnecessary risks. The book in question, usefully illustrated, is replete with excellent advice and should be carefully studied by railwaymen of all grades and in all phases of railway employment. We trust that a reduction in the number of staff-accidents on the Lancashire and Yorkshire Railway will be the result of the issue of this very comprehensive booklet.

* * *

The Canadian Pacific Railway, 62, Charing Cross, London, S.W.1, has just issued an interesting illustrated handbook entitled "Education in Canada." Compiled by Miss Florence B. Low, it contains many charming descriptions of Canadian school life and a wealth of information respecting the educational facilities existing throughout the Dominion—from the palatial McGill University to the tiny prairie school-house shack with its accommodation for nine or a dozen children, who mostly ride or drive to school and house their steeds in the stables provided for that purpose. The book also includes particulars of the salaries paid and deals with the openings that exist for British teachers in Canada and indicates the conditions under which those trained in the British Isles may secure recognition in the Dominion. The handbook may be obtained free on application.

* * *

At a recent staff "Efficiency" meeting, Mr. C. J. Spencer, O.B.E., Manager, Metropolitan Electric, London United and South Metropolitan Electric Tramways, gave a lecture entitled "A Transport Man's Visit to America." This paper, dealing principally with surface transport in New York and other great American cities, proved exceedingly interesting, and was thoroughly appreciated by a representative gathering of some 300 of the supervisory grades of the Underground Railway and London General Omnibus Company.

* * *

The Lancashire and Yorkshire Railway has always been in the forefront of those companies who have given attention to the education of their employees. Having in mind the success which has attended the School of Signalling, Mr. Ashton Davies, Superintendent of the Line, has arranged for a series of lectures dealing with the clerical work of the Commercial Section of the Coaching Department. The opening Lectures were given on November 22, at Manchester and Preston. At the former place the Lecture was given by Mr. D. Price, Office of Superintendent of the Line, the Chairman being Mr. Geo. Hawkins, Assistant to Superintendent of the Line, whilst at Preston the Lecture was given by Mr. G. Dowding, Office of Superintendent of the Line, Mr. F. J. Neele, District Passenger Superintendent, presiding. The Lecturers dealt very fully with the question of the Labelling, Packing and General Regulations governing the acceptance of traffic, and subsequently it is proposed to cover every branch of Parcels and Booking Office routine such as :—

Owners' and Limited Risk Agreements and Consignment Notes.

Rates and Charges for all description of traffic carried by Passenger Train.

Insurance.

Recording of Forwarded Traffic.

Recording of Received Traffic.

Contracts for Mails, Newspapers, &c.

Accompanied Traffic.

Left and Lost Luggage.

Compilation of Parcels Accounts, Summaries, Balance Sheets, &c.

Claims.

Booking Office Equipment, Accountancy, Returns and Summaries, and General Matters.

A large number of students have been enrolled and for the sake of convenience classes are being held at other centres to enable the staff to travel from the stations at which they are employed. No expense whatever is incurred by the students, and periodically there will be examinations and prizes awarded to those attaining a certain standard of merit.

* * *

One of the most active sections of the London "Safety First" Council is that which represents railways. The Railway "Safety" Committee, as it is called, recently reported that considerable progress had been made with the competition for the children of railway employees; that upwards of 10,000 condition leaflets and entry forms had been distributed, and wide publicity accorded by the general Press and Official organs of railway companies. Also that arrangements had been made for adjudication of the essays to be received. The members of the committee are Mr. G. H. Dennis (L.B. and S.C.R.) Mr. H. E. Blain, C.B.E. (Underground), Mr. F. W. Hopper (S.E. and C.R.), Mr. J. P.

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Thomas (London Electric), Mr. J. Thornton (Central London).

* * *

By a statement issued by the Ministry of Transport it is shown that the financial results of working the controlled railways in the United Kingdom for the month of October, 1920, resulted in a net Government liability for the month of £4,936,906, due to the falling off in receipts consequent upon the miners' strike. November results are similarly affected.

* * *

In addition to providing a most convenient and direct means of reaching the recent successful International Advertising Exhibition at the White City by means of their station inside the grounds, the Metropolitan Railway exhibited a specially constructed full-size section of their electric rolling-stock, effectively demonstrating, on the one hand, the luxury and comfort of present-day travel and, at the same time, forcibly bringing home to potential advertisers the high standard, incomparable value and paying certainty of electric railway carriage advertising. The car, which was brilliantly lighted and advantageously placed, was visited by thousands of visitors and further constituted a record in rapid construction, it having been made and erected at the Birmingham plant of the Metropolitan Carriage, Wagon and Finance Company in the brief period of 10 days.

THE METROPOLITAN RAILWAY'S EXHIBIT AT WHITE CITY.

* * *

In the House of Commons, on December 1, Mr. Neal, in answer to Mr. Briant, said: The position of the Irish railways in consequence of the refusal of the railwaymen to handle certain Government traffic grows increasingly acute. Passenger and goods trains have ceased to run on the undermentioned sections:—Great Southern and Western Railway: Limerick to Waterford, Limerick to Tralee, Ballingrave Junction to Foynes, Patrickswell to Charleville, Killonan to Nenagh, Birdhill to Killaloe, Clare to Banagher. Cork, Bandon and South Coast Railway: Kinsale Junction to Kinsale, Clonakilty Junction to Clonakilty. Ballinascarthy and Timoleague Railway and Timoleague and Courtmacsherry Extension Railway: Ballinascarthy to Courtmacsherry. Great Northern (Ireland) Railway: Dundalk to Enniskillen, Inniskeen to Carrickmacross, Ballybay to Cootehill, Ballyhaize to Belturbet, Bundoran Junction to Bundoran. Londonderry, Lough Swilly and Letterkenny Railway: Tooban Junction to Burtonport, Buncrana to Cardonagh. Passenger services have ceased to run on the undermentioned systems or sections, but a goods service is maintained, in almost every case a reduction from the normal, and in some cases a reduction of considerable magnitude:—Great Southern and Western Railway: Roscrea to Nenagh, Kildare to Kilkenny via Carlow, Limerick to Sligo, Mallow to Tralee. Midland Great Western Railway: Athlone to Achill, Manulla Junction to Killala. Cork, Bandon and South Coast Railway: Drimoleague Junction to Bantry, Cork to Skibbereen. Cork and Macroom Direct Railway, Cork and Muskerry Light Railway and Donoughmore Extension. Tralee and Dingle Railway and West and South Clare Railways. The following systems or sections have been affected, but a passenger and goods service has been maintained with varying degrees of reduction from the normal:—Great Southern and Western Railway: Tralee and Valentia Harbour, Roscrea to Birr, Maryborough to Waterford; Ballina to Tullow, Mallow to Waterford, Waterford to Wexford and Rosslare Harbour, Clonmel to Thurles, Kingsbridge to Cork. Midland Great Western Railway: Broadstone to Clifden Mullingar to Sligo, Inny Junction to Cavan, Clonsilla to Kingscourt, Edenderry Branch, Killeshandra Branch, Athboy Branch, Ballinrobe Branch. Londonderry and Lough Swilly Railway: Londonderry to Buncrana. Listowel and Ballybunion Railway.

* * *

A "London Traffic Talk" was given recently by Mr. H. E. Blain, of the London Underground Railways, before members of

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the United Wards' Club, at Cannon Street Hotel. Mr. Blain showed how great had been the growth of metropolitan traffic, especially in recent years, and said London was now the greatest riding city in the world, having outstripped New York, which formerly held the record. Speaking of the improvements recently effected in motor-omnibuses, he said that a type of vehicle which would shortly be seen upon the streets, in numbers that would rapidly increase, would undoubtedly revolutionise omnibus traffic and would probably considerably affect the trams.

* * *

A NEW subway was opened under Charing Cross Railway Station (Underground) on December 6, to relieve the congestion of traffic caused by the clash of people who are going down and people who are going up. As about 130,000 passengers per day use the communications between the District Railway and the Tubes at this station the convenience of causing each stream of traffic to flow in one direction is obvious. The engineering work involved was interesting. The roof of the new subway is only 18 in. below the level of the rails, and the floor is below the level of the subsoil water. To meet this double difficulty the ceiling is made of asbestos sheeting, packed with slag wool to deaden the noise of the trains; and the foundation is a cast-iron tank. Fifteen men did the work, with 80 trains an hour rattling and roaring above them. The cost of the subway, which is 60 ft. long, was about £12,000.

* * *

ON the North Staffordshire Railway four new 0-4-4 passenger tank engines have recently been completed at the Stoke Works. They are similar to the 1907-8 engines of the same type, with the exception that larger bunkers have been provided. The numbers of these engines are: 15, 17, 19 and 54. The old engines which bore these numbers are now on the "A" list. During the period 1914-19 two new classes of 0-6-4 tank engines were constructed at Stoke, as follows: "New C" class (5 ft.), Nos. 4, 5, 30, 31, 53, 70, 173 and 174; "F" class (5 ft. 6 in.), Nos. 114-121 inclusive.

* * *

CONCERNING London and North Western Railway locomotives, Mr. C. Williams writes:—Nos. 1092, 1096, 1097 and 1133 are the latest new engines of the four-cylinder "Claughton" class to be turned out at Crewe. These complete the batch mentioned on page 361 of the November issue. A new series of similar type will shortly be put in hand. No. 1934, "Blenheim," a "Jubilee" class four-cylinder compound, has been converted to "Renown" class (two-cylinder simple), while No. 1241, a four-cylinder compound mineral engine, has been simplified and superheated. No. 1286, a two-cylinder 0-8-0 (formerly four-cylinder compound), has been superheated. Another of the 0-6-2 passenger tank engines has been fitted for motor service, viz., No 16. The following table (corrected to November 1) gives the remaining four-cylinder compounds and their classes, with the number of each class:—

4-4-0	"Alfred the Great"	26
4-4-0	"Jubilee"	19
0-8-0	Mineral	85
2-8-0	do. (Large Boiler)	12
2-8-0	do. (Small Boiler)	19
	Total	161

* * *

IN view of the interest taken by various readers in the four once well-known Great Western Railway 4-4-0 locomotives No. 7, *Armstrong*, No. 8 *Gooch*, 4,169 *Brunel*, and 4.170, *Charles Saunders*, reference to a letter from Mr. W. N. Parry, of Wolverhampton, will be in place. He mentions that some months ago he saw all four of these engines outside Stafford Road sheds awaiting attention. *Brunel* was first dealt with, but has not been seen since it left the shops. *Charles Saunders* has lately been working in the Wolverhampton district. More recently *Gooch* has been back at work again, and *Armstrong* is apparently next to receive shop attention.

* * *

AT the official opening of a further section of the North Coast railway line in Queensland recently, the Minister for Railways made an interesting announcement on the Queensland Government's railway policy. The new section was from Styx River to Wumalgi, and after referring to the advantages which would accrue from the completion of the whole coastal line, the Minister said it was estimated that the section to Mackay would be opened in August next year, to Townsville in March, 1922, and Cairns 1923, which would enable passengers to travel right through from Perth to Cairns, over 4,000 miles. He touched on the difficulties which had been experienced in securing rails and cement, and stated that of the total distance of 645 miles from Rockhampton 58 miles had been constructed before the construction of the North Coast line had been commenced. Since then 263 miles had been constructed and 119 miles of tramways taken over, and 205 remain to be built. The total cost of the railway to date was £2,500,000, and the estimated cost to complete the line was £13,000,000. With the

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opening of a section on the Mackay end to Carmilla Creek they would then have 5,700 miles of railway in Queensland. They had invested £45,700,000 in railways. The revenue of last year was £4,935,600, an increase of £953,000 on the previous year. In referring to what he termed unfair criticism levelled at the railway department, Mr. Larcombe said it had been stated that the department had shown a deficit during the last two or three years. He wanted to remind them that before the present Government came into power, the accumulated deficit on the railway service was £8,000,000. He wanted to remind them that other States of smaller area and larger population like Victoria had also had railway deficits. With a railway department there were other features besides making profits. It was an excellent thing to balance the ledger and the railway department was constantly endeavouring to do this, but there were other factors more important than balancing the ledger. They wanted to fully and suitably develop this great State, and to prevent a constant rush to the cities. They wanted people to go out and take up land and increase wealth and production; but if they were to increase fares and freights every time the ledger did not balance, they were not going to discharge this important responsibility. The main lines of Queensland had paid exceedingly well. The deficiency was in the agricultural lines.

* * *

A MEETING of the Institution of Locomotive Inspectors and Foremen was held at Victoria Station, London, on November 27, and, after the usual business, Mr. R. P. C. Sanderson, M.I.L.E., of the Baldwin Locomotive Works, read a paper on "Electric Welding in Locomotive Manufacture," which proved most interesting and a good discussion taking place. Mr. Sanderson exhibited a large number of photographs of the welding taking place; also brought a number of pieces of metal which had been welded for inspection.

* * *

LONDON, BRIGHTON AND SOUTH COAST RAILWAY services to and from all parts of the Continent, via Newhaven and Dieppe, are now running regularly, from London (Victoria Station) or Paris (St. Lazare) at 10 a.m. every week-day and Sunday. The Channel services are maintained by the fine turbine steamers *Paris, Rouen, Newhaven, Dieppe and Brighton*, which make the journey in about 3¼ hours. Through fares and baggage rates are in operation between London and the most important holiday centres in Switzerland and the Swiss health resorts have organised every description of winter sports which are increasingly popular with British travellers.

* * *

THE "Brighton in an Hour" Pullman train, "The Southern Belle," which performs the journey between Victoria and Brighton in 60 minutes, is regaining its old-time popularity. During the war this train was suspended, but now it again makes two journeys between London and Brighton daily within the hour. This train of Pullman Cars first performed the journey from London to Brighton in 60 minutes in October, 1899. It was then known as "The Brighton, Limited" train, but in 1908 a new train of luxurious Pullman Cars with all the latest improvements was specially built for this service and to it was given the name of "The Southern Belle."

* * *

OWING to high wages and the price of coal, and the small number of passengers travelling on the Furness Railway's Windermere Lake steamers last year in the winter, the running of these boats has been suspended during the present winter, and motor 'buses have been put into service between Lake Side and Ambleside. The running of these motor 'buses is experimental, and possibly additional roadside traffic will be picked up.

* * *

AT the December general meeting of the members of the Railway Club, 65, Belgrave Road, S.W. 1, Mr. Edwin J. Miller gave an excellent lantern lecture on "The Electric Underground Railways of Paris." A lantern lecture on "The Development of the Modern British Express Locomotive," will be given by Mr. R. L. Burge on January 14. On Friday evening, February 11, Mr. H. L. Hopwood is to present his paper, entitled "Ten Years' Progress at Doncaster Works, Great Northern Railway." RAILWAY MAGAZINE readers desirous of joining the club in the New Year should now make application to the hon. secretary.

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THE RAILWAY MAGAZINE.

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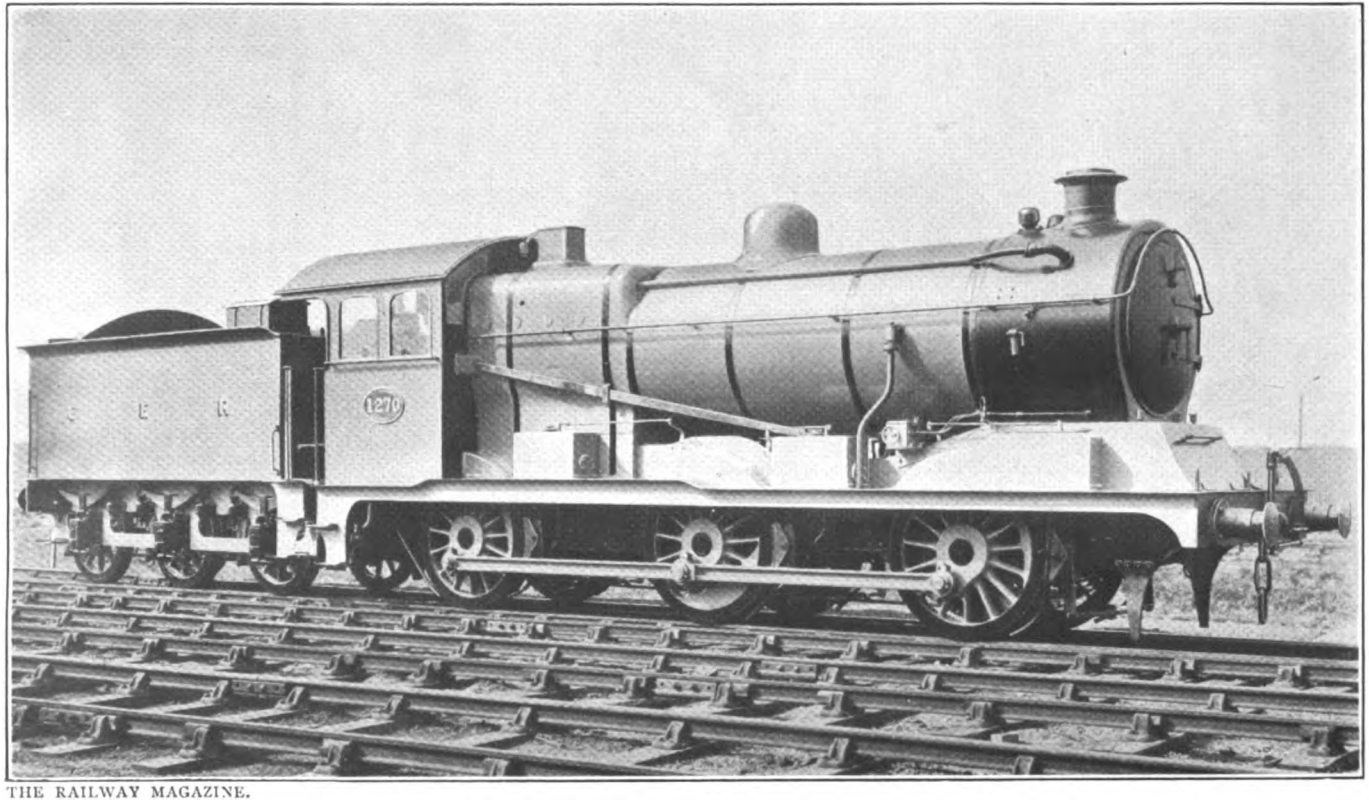

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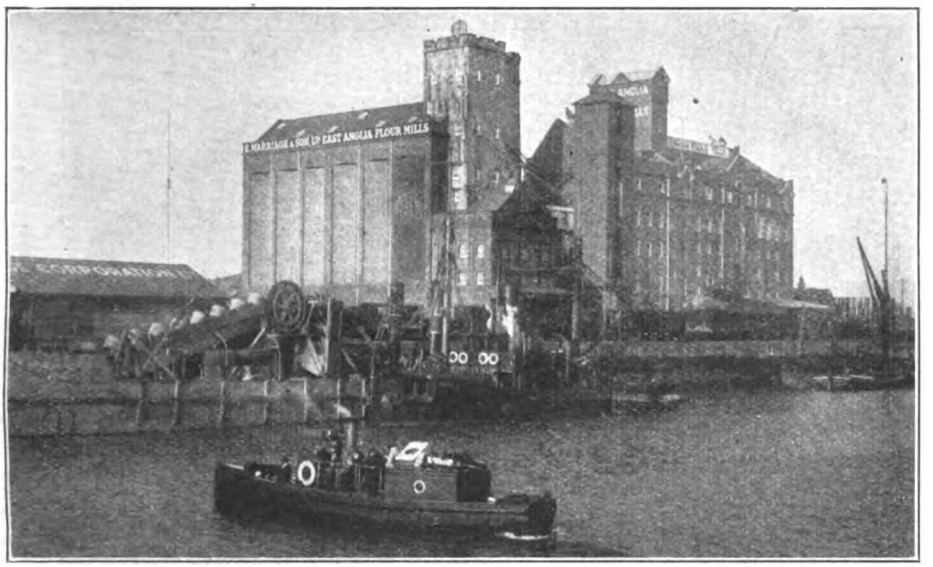

GREAT EASTERN RAILWAY MOTOR BOAT "PIN MILL" LEAVING FELIXSTOWE DOCK.

The Felixstowe Railway.

By J. F. GAIRNS.

INCORPORATING the name of St. Felix, who flourished some twelve centuries ago, Felixstowe has within recent years taken its place as one of the most favoured of select health resorts. With a southerly aspect, well-sheltered, miles of splendid shingle or shingle and sand beach, and sunshine and health records which maintain very high standards, the town attracts visitors of a high-class order in large numbers, not only in the summer season but also during the autumn, winter and spring months. Invalids and convalescents are often recommended to it; business people in considerable numbers, not only from Ipswich but also from London, select it for residential purposes, and week-end visitors are numerous all the year round. Locally, Felixstowe is in great favour. Within easy distance of Ipswich, that busy town sends visitors by the thousand during the season and in large numbers at other times, and it is an easy trip across from Harwich, while its moderate distance from London, the good and frequent train facilities, and the attractions it has to offer account for a constant stream of visitors throughout the holiday period. It is also one of the nearest seaside resorts to the industrial towns of the south Midlands, and though cross-country train services are not what they were before the war, the various routes which centre upon Ipswich render it convenient of access from all parts.

Situated on a peninsula bounded by the Rivers Orwell and Deben, on one side directly bordering upon Harwich Harbour and the estuary of the Orwell, upon the other facing the broad expanse of the North Sea, but with a southerly aspect, Felixstowe combines the attributes of a high-class seaside resort and a centre for river tours and for excursions to the many places of interest within easy reach.

On the seaward side a splendid shingle beach extends for three miles from Landguard Fort at the apex of the peninsula to Cobbold's Point, while northward is a sand and shingle beach. A two-mile promenade, the picturesque cliff faces, partly laid out as gardens, a range of high-class hotels, including the Felix—recently acquired by the Great Eastern Railway Company, and considered to be the finest hotel on the East Coast—a good

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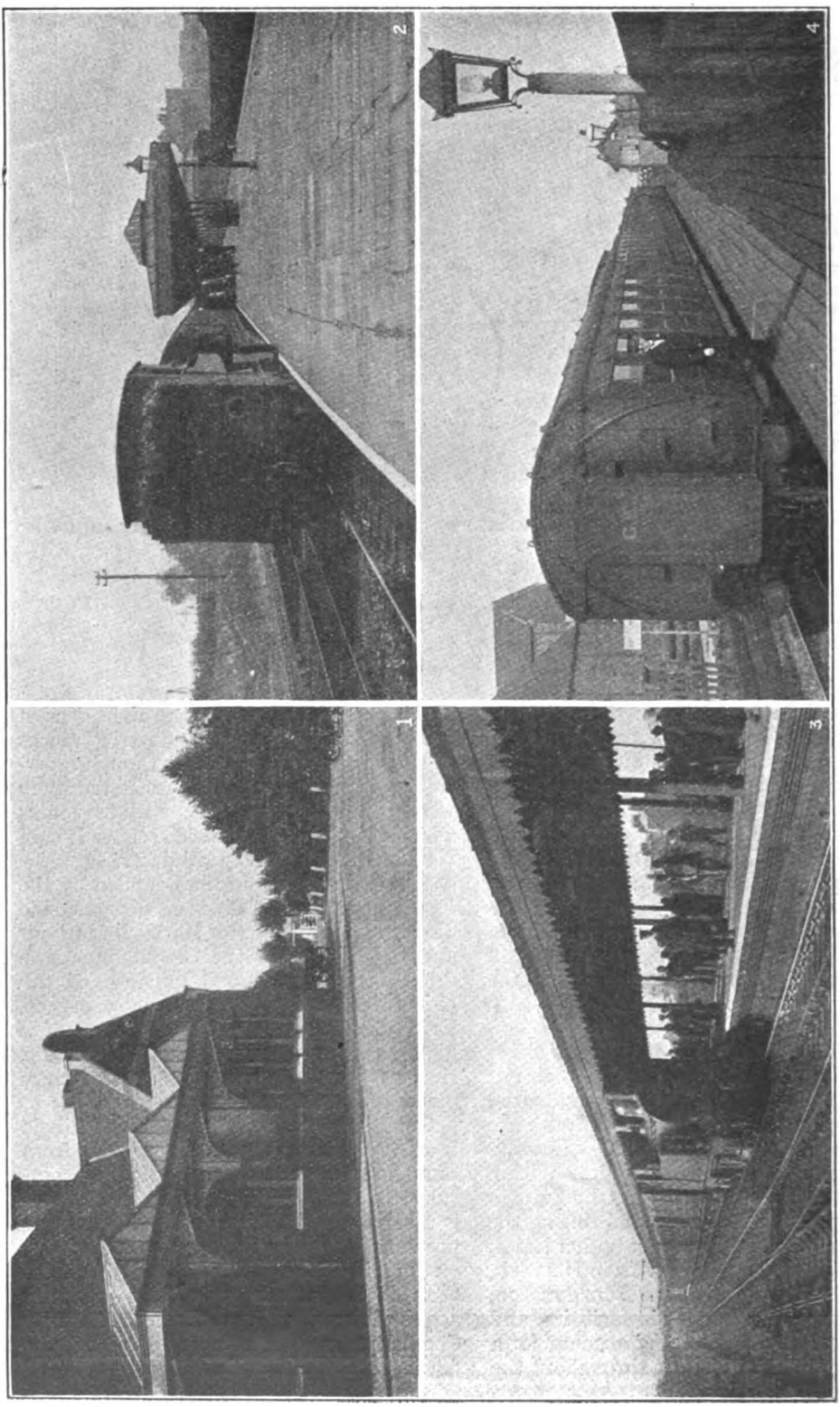

(1) EXTERIOR OF FELIXSTOWE TOWN STATION.
(3) INTERIOR OF FELIXSTOWE TOWN STATION.
Mr. F. Ainger, Acting Stationmaster, is seen on the platform.

(2) ANOTHER VIEW OF FELIXSTOWE TOWN STATION.
(4) FELIXSTOWE PIER STATION.
Mr. W. Woods, Stationmaster, Beach and Pier Stations, on platform.

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choice of boarding-houses directly fronting or adjacent to the sea, amusement pavilions to suit all tastes, seaward Felixstowe is well-favoured. Riverwards Harwich harbour is usually the scene of much shipping activity, while it still maintains some of its war-time characteristics as a naval base. Across the river is Harwich, with Dovercourt and Parkeston Quay (whence sail the Great Eastern Railway Company's Continental steamers) adjacent; while Great Eastern Railway river steamers maintain services during the summer months across to Harwich and up the river to Ipswich, (in the winter months motor boats work between Harwich and Ipswich), in conjunction with motor boats plying between Felixstowe, Harwich and Shotley.

Interests of golfers are met by the 18-hole courses of the Felixstowe Golf Club and the newer Felixstowe Grove Club. Sea-fishing from the long pier on the seaward side or from boats is good, while fresh water angling, tennis and other recreative activities are all well provided for.

There are now three railway stations in Felixstowe, but that known as the Town station, the centre of most of the traffic and convenient for the newer parts, was not opened until July 1, 1898. As first constructed by the Felixstowe Railway and Pier Company, the line from Westerfield Junction on the Ipswich-Yarmouth line, Great Eastern Railway, ran direct, *via* the disused curve adjacent to the present Town station, to Felixstowe Beach (then known as the Town station) and onwards to the Pier station, serving the railway or "old" pier and the Felixstowe Dock Company's premises.

Incorporated as the Felixstowe Railway and Pier Company, July 19, 1875, "for the purpose of constructing a railway, commencing in the parish of Felixstowe and terminating at a junction with the Great Eastern Railway, in the parish of Westerfield," the Felixstowe Railway was opened for passenger traffic May 1, 1877, and for goods traffic during the following month. The enterprise also included the construction of a pier in connection. By Act of July 13, 1876, the company was authorised to construct a tidal basin or dock and other works at Felixstowe, but the original plans were abandoned and replaced by others under an Act of July 21, 1879, which also authorised a change of title to "Felixstowe Railway and Dock Company." The dock proper, which is still maintained as a separate concern under the same title, was opened in 1886.

For a short period the Felixstowe Railway worked its own traffic and provided its own locomotives and rolling-stock, the former including an interesting 2-4-0 tank class with 14-in. by 20-in. cylinders and 4-ft. 7½ in. coupled wheels, later employed on the Victoria Park and Royal Albert Dock lines. Commencing September 1, 1879, the Great Eastern Railway took over the working of the line, though it was not until later that the special rolling-stock of the Felixstowe Railway disappeared.

Under agreement dated November 17, 1886, confirmed by Act of July 5, 1887, the consideration being £164,000 nominal amount of Great Eastern ordinary stock and £57,000 in cash, the undertaking was sold to the Great Eastern Railway Company, with the exception of the dock and dock railways, which are still operated privately as above mentioned.

Northwards from Felixstowe along the coast is the estuary of the River Deben opening into Woodbridge Haven, and under an Act of May 23, 1887, a 3½-mile railway, to be known as the Felixstowe and Baudsey Ferry, was authorised. This, however, was never made and the enterprise has been long since abandoned.

It will now be convenient to consider the railway itself, commencing, however, at the Westerfield Junction end. Three miles 45 chains from Ipswich, along the Yarmouth main line, Westerfield Junction is the centre for a fair amount of residential traffic to and from Ipswich, and a considerable volume of interchange between up Felixstowe and down Yarmouth or up Yarmouth and down Felixstowe traffic, but it no longer figures as the regular interchange station for the branch except between up and down or down and up trains on the respective routes.

There are, however, besides the main lines two terminal roads on the up side of the station, at one time used by Felixstowe trains, which now work through to and from Ipswich itself. One of these terminal lines is served by the other face of the up main platform, but the other has now only a short length, preserved to serve the booking office and

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WESTERFIELD JUNCTION.

East Suffolk main line to left, Felixstowe Railway platform to the right.

Mr. Knight, Stationmaster, is seen standing on the short piece of the original Felixstowe Railway platform still in use to accommodate the booking hall and station offices.

waiting rooms, giving access to the main platforms behind the buffer stops. The remainder of the platform has long since been removed, and these lines are little used, except as sidings or for storage purposes.

Leaving Westerfield Junction the Felixstowe branch curves away to the right and becomes single track until Derby Road station is reached, 2 miles 45 chains distant. Technically known as Derby Road, Ipswich, though it is distant by rail 6 miles 10 chains from the main station at Ipswich, it is within an easy tramcar ride of many parts of the town, and a great deal of traffic passes that way, thus saving the cost of the somewhat lengthy mileage involved by rail journey. Adjacent is a considerable residential district, while tramcars find their terminus on railway property immediately outside the entrance to the booking hall. At the western end of the station the railway passes under a public road through two arches, one for each line. Eastward of the station, on the up side, is an extensive goods and coal yard.

Once clear of the sidings single line is again entered upon, and 3 miles 17 chains further on the pretty little station of Orwell is reached. Approach in both directions is through an avenue of trees while the down platform is entirely backed by foliage. On the up side are the station offices and limited sidings, to which extent the woodland surroundings are encroached upon, but in whichever direction it is viewed Orwell appears as a pretty "station in a wood."

Trimley station, 4 miles 59 chains distant, is an ordinary country "crossing" station, with a fair amount of traffic on its own account, but hardly distinctive in any special degree. A short run of a little more than a mile and the cutting through which the old line ran direct to Felixstowe can be seen on the right, while the train curves towards the north to join the incoming line from the Pier and Beach to enter the Town station (terminal).

Opened, as already mentioned, on July 1, 1898, Felixstowe Town station is of entirely modern construction. There is one long double-sided platform roofed for about half its length, and on each side is a terminal line with run-round road, the usual procedure being for engines to run round their trains in order to continue the journey. Outside the station two single lines join, so that trains from either direction can use either side of the platform. Beyond the buffer stops is a wide circulat-

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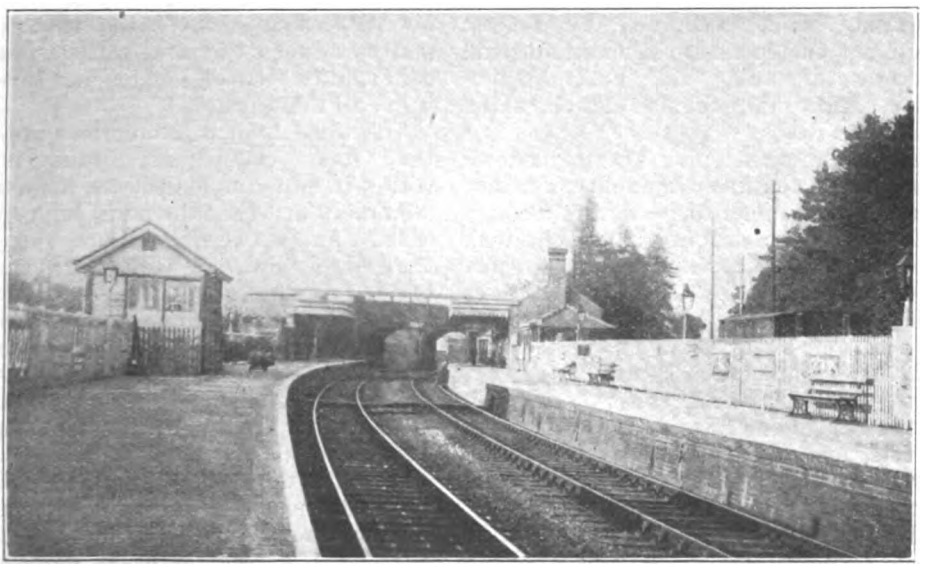
ing area with bookstall and serving the station offices, refreshment room, &c., while on one side it is open to the station yard, which is characterised by foliage and well laid-out gardens of most attractive appearance. The front of the station has the usual road access and enclosure. The circulating area is so laid out that a further platform can be built when necessary to extend from it, on the site of the present goods yard and sidings.

Our engine having run round the train the journey is recommenced *via* a curve to rejoin the original line. Passing through the older part of the town, adjacent to the Beach station is a busy goods yard, the local carriage sidings and engine shed. The station itself has only one through platform and line, but alongside is a terminal bay, as not all trains run through to the Pier station. The last section of 66 chains includes two siding connections, one to a Government aircraft factory and depôt established during the war, and the other to the lines of the Felixstowe Railway and Dock Company. The Pier station is a single-platformed terminal with run-round line. The railway extends on to the pier itself, but is now rarely used as the walk to the steamer pier is very short. To the right is Felixstowe Dock, where a landing stage is provided to serve the Great Eastern Railway motor boats, *Pin Mill*, *Epping* and *Hainault*, which ply across to Harwich and to Shotley. The larger steamers, *Norfolk and Suffolk*, use the "old" pier itself, running to Harwich and up the river to Ipswich during the summer.

Several services are given by each daily, and in the summer months there is a large traffic passing across to Harwich, and also up and down the river, while the facilities thus given are utilised to a considerable extent at other times. In connection with these, round-trip tickets are in great favour, down by train returning by steamer, or *vice versa*. The steamers are paddle vessels of 245 and 295 gross tonnage; the motor boats, of 11 or 22 tons, are capable of taking 20–30 passengers comfortably. During the summer months the steamboats make six double journeys daily between Ipswich, Harwich and Felixstowe, occupying 80 min. each way. The motor boats make nine double trips between Felixstowe and Harwich. On Sundays the totals are two and seven, respectively. During the remainder of the year the service is maintained by motor boats between Harwich and Ipswich, which run twice daily, in conjunction with the motor boats between Felixstowe and Harwich, which make four or five trips, with no Sunday services.

Single line throughout, though in most



DERBY ROAD STATION, IPSWICH.

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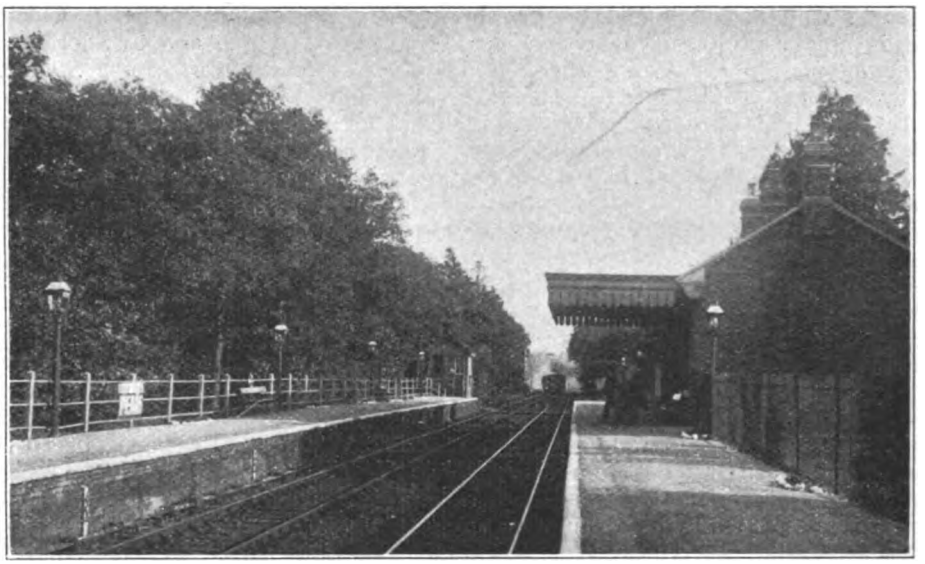

ORWELL: A RAILWAY STATION IN A WOOD.

places provision is made for doubling when required, the Felixstowe branch is controlled by electric train tablet apparatus between Westerfield and Felixstowe Town, with crossing places at each station, also onwards to Felixstowe Beach. The Pier extension is worked by train staff without tickets and by only one engine in steam (or two coupled together). No work is done by the railway engines on the Aircraft and Felixstowe Dock branches, local shunting being performed by horses. Adjoining the docks are several industrial concerns, including the East Anglian Flour Mills, the Stanlee Shipbreaking Company, &c.

Although single line, the Felixstowe branch has a considerable number of trains. During last summer there were 15 through trains daily to and from Ipswich, with another running between Felixstowe pier or Beach and Derby Road. On Sundays there were four through services and one to and from Derby Road. Several trains were non-stop between Ipswich and Felixstowe Town, covering the 15¾ miles in 30 min., including four slacks for changing tablets, and over a line which is fairly severely graded in places. In several cases through carriages were conveyed.

The winter service includes 13 through trains each way, and one to and from Derby Road. Restaurant cars working through to London are run on the 7.50 a.m. *ex*-Felixstowe Beach, returning on the 3.20 p.m. *ex*-Liverpool Street, 5.8 p.m. from Ipswich. Through carriages are provided on the 9.8 a.m. from Felixstowe Beach and 3.17 p.m. from Felixstowe Pier, returning on the 12.30 and 4.55 p.m. trains from Liverpool Street. Other services give good connections with main line trains at Ipswich, so that several times daily the through journey can be made between Felixstowe Town and Liverpool Street in not a great deal over the two hours, and in through carriages with restaurant car facilities between London and Ipswich, if not all the way.

The usual branch locomotives now are the "1060" class of 2-4-2 tank engines with 5-ft. 8-in. coupled wheels, these being admirably fitted for the fairly high speeds called for between stations. A few trains are, however, worked by engines of the main line classes, from the 1500's downwards, especially where a run on the Felixstowe branch is combined with a main line duty. Three locomotives are usually stabled at the Beach engine shed, further requirements being supplied from Ipswich. Trains are also stored adjacent to the Beach station, there being no accommodation at the Town station. Two or three goods trips by the ordinary 0-6-0 engines meet the usual daily needs of the branch.

Engineering works are not heavy, the

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cuttings and embankments being generally of average depth or height, though between Westerfield Junction and Derby Road is a fairly high embankment and viaduct. The stations as far as Felixstowe Town are all of modern type, with long platforms capable of taking trains of 12 or even 16 six-wheelers, as occasionally required; but the Beach and Pier stations are somewhat old-fashioned and await their turn for modernisation. Intermediate stations beyond Derby Road provide for ordinary agricultural traffic, with a proportion of residential travel, serving also country houses and the residences of retired business people.

During the summer several thousands of people from Ipswich and the surrounding districts may visit Felixstowe daily, and on Bank Holidays the total sometimes reaches 15,000; but the rowdy element is seldom or never included. The dock and the various adjacent industrial establishments account for a fair amount of industrial traffic. A proportion of the holiday traffic proceeds to the Beach station, which also serves the garrison at Landguard Fort; but the Town station takes the main pressure on the passenger side. General oversight of the carriage sidings and engine sheds at the Beach station comes under Mr. Woods, who is also in charge of the Pier station and the related steamer and motor boat traffic. An unusual feature is the provision near the engine shed of a carriage painting shop, "a branch of Stratford Works."

The town station is at present under the charge of Mr. E. Ainger, relieving stationmaster, pending a permanent appointment in place of Mr. Read, recently retired. During the season there is an average of 700 season tickets issued to Ipswich people alone. Some of these commence at Derby Road, passengers travelling to and from Felixstowe daily or as desired, while others centre upon Felixstowe, the holders continuing their business connections in Ipswich.

The Felix Hotel, recently acquired by the Great Eastern Railway, deservedly considered the finest and most luxuriously furnished on the East Coast, provides a further attraction to Felixstowe. It possesses 250 rooms. Throughout the building there is very fine carved woodwork; in the front hall a handsomely carved oak staircase especially attracts attention, while a valuable collection of antique furniture adds considerably to the dignity and attractiveness of the fine rooms. The Winter Garden or Palm Court is beautifully decorated in the early Georgian style, and the wide "couloir" surrounding it gives convenient access to the various public rooms. The dining-room, in the

THE FELIX HOTEL.

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later Georgian style, is a magnificent room seating 200 persons, while in front and towards the sea, there is a restaurant seating about 80. The Elizabethan ball room is oak-panelled all round the walls, and, in addition to having two fine carved mantelpieces and a splendid oak floor, has the national emblems ot England, Scotland and Ireland glazed in colour in the windows. The smoking room, reading room and lounge are also richly decorated.

The antique furniture in the various public rooms includes some remarkably fine examples of various periods. Especially notable in the ball room are a fine Queen Anne chiming clock, a Gothic panelled and carved Jacobean oak chest, a Georgian chest with inlaid panels, Queen Anne china cabinet with cabriole legs, two Queen Anne chests (one with claw and ball feet with carved knees), two Queen Anne dressing tables with cabriole legs, a walnut writing table of the same period, and a Charles II settee. Into the wall panelling of this room have been let a set of 20 of the famous Bunbury Shakespearean prints in colour.

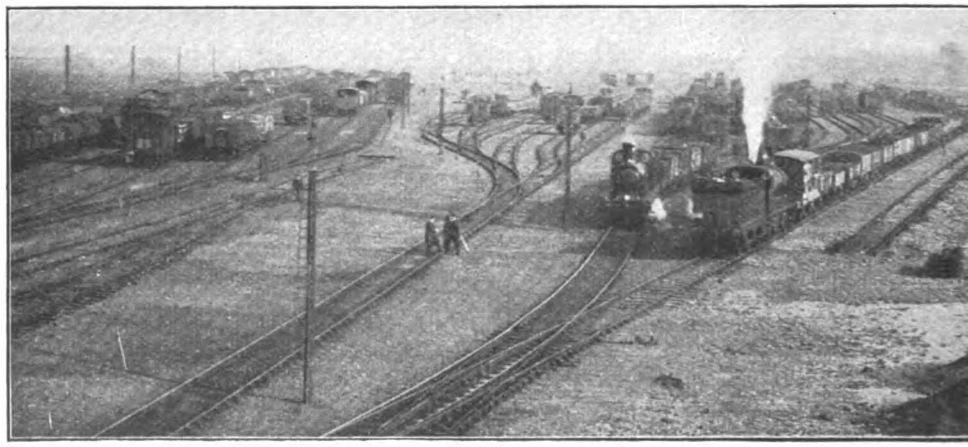
In the billiard room a mahogany Chippendale cabinet contains a valuable collection of old pewter, also there is a Georgian corner cupboard and an old Parliament clock in lacquered case. Especially noteworthy in the reading room are a mahogany inlaid Sheraton china cabinet containing Blue Nankin and old English china, a mahogany Empire bureau with brass gallery and furniture, a splendid mahogany and satinwood Sheraton china cabinet, a Queen Anne clock, a pair of genuine old Adams mirrors with handsomely carved and decorated pediments, and a pair of exceptionally fine Hepplewhite white and gold decorated Console tables.

Another collection of Nankin and old English china is in a Sheraton cabinet in the smoke room, where there is also another Parliament clock. It may be interesting to note that this clock and the one in the ball room date from the period when Parliament imposed a duty on all clocks over a certain size, consequently it was usual to find them in the old coaching houses and village inns to which residents in the neighbourhood were wont to resort when they wished to know the time.

On the seaward side are splendid lawns and gardens extending down the cliff face to the beach, while adjacent to the hotel are grass and hard tennis courts, garage, &c.

In conclusion the writer would express his indebtedness to Mr. E. Ainger and Mr. W. Woods, in charge of the Town and Beach and Pier stations, respectively, and to officials of the Great Eastern Railway for assistance and information supplied for the purposes of this article. All photographs reproduced, except the last illustration, were specially taken by the author.

FELTHAM CONCENTRATION YARD, L. & S.W.R.



VIEW OF YARD FROM WATER-TANK TOWER, SHOWING NEW SIDINGS. (*See page* 111.)

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Railway Operating in France, 1915-18.

[No. I.]

By M. C. ROBSON.

THE problem of the feeding and supply of a large modern army is so bound up with the science of railway transportation that the following outline of the work performed by the British railwaymen in France during the war may prove of interest.

The burden laid on the Chemin de Fer du Nord by the war was so enormous, and the loss of engines and material during the German advance in 1914 so heavy, that in 1915 Great Britain was called upon to supplement the technical staff in the war area and the Railway Operating Division of the Royal Engineers was formed.

The personnel of the Division was originally drawn from the South Eastern & Chatham Company's staff, who took over the dock working at the Bassin Loubet, Boulogne; but it was at once realised that more men would be required, and other British Companies were called upon to provide officers and men.

The R.O.D. began its work in France at Boulogne with six South Eastern & Chatham tank engines, and was responsible for all dock shunting and the formation of all outgoing trains for the British Army. In November, 1915, the first section of main line railway was taken over from the French authorities. This was the line from Hazebrouck to Poperinghe, and the R.O.D. headquarters for this section were placed at Hazebrouck, being subsequently removed to Borre. The Division was commanded by Colonel C. Paget, the General Superintendent of the Midland Railway, and the whole of the working of the Division throughout the war was based on the control system as in force on that railway, necessarily modified to the new conditions.

The officers of the R.O.D. were not on the Administrative Staff of the British Army, the Division being purely technical, just in the same way as the Motor Transport Services were kept distinct from the Headquarters Staff. To explain more fully—the general policy of the Army having been decided by the staff at G.H.Q. instructions were then given to the Railway Transport Services (Administrative Staff) to arrange the necessary movements of troops and stores. These were fixed up by the Assistant Directors of Railway Transport for the areas concerned, who had to settle the timetables of the trains with a body called the Commission Regulatrice. This was a French organisation of army officers, who were responsible for all movements over the French lines. Once the timetable details were fixed, the programme was supplied to the Nord Railway and the R.O.D., who were responsible for all the technical details as to the supply of rolling-stock, engines, &c. So far as these were concerned, the Railway Transport Establishment officers were not interested.

The locomotives used on the Poperinghe section were Belgian six-coupled goods engines of "Caledonian" design, which were among several engines withdrawn from Belgium during the retreat of 1914, supplemented by some very fine tank engines built in England for the Dutch railways, but which found their way to France instead.

There was a considerable amount of opposition in some quarters to the British taking the complete control of this branch line, and it would be idle to deny that difficulties arose while the R.O.D. men were getting accustomed to the new conditions. The language difficulty was a very real obstacle at the Exchange Station; but it was remarkable how soon a mutual understanding was come to between the Frenchmen and the R.O.D. staff, and a species of "Anglo-French" grew up which quite served its purpose.

It was not long after the Poperinghe line had been taken over that it was seen that a further extension of R.O.D. activity would be necessary. The planning of the Somme offensive for 1916 disclosed the

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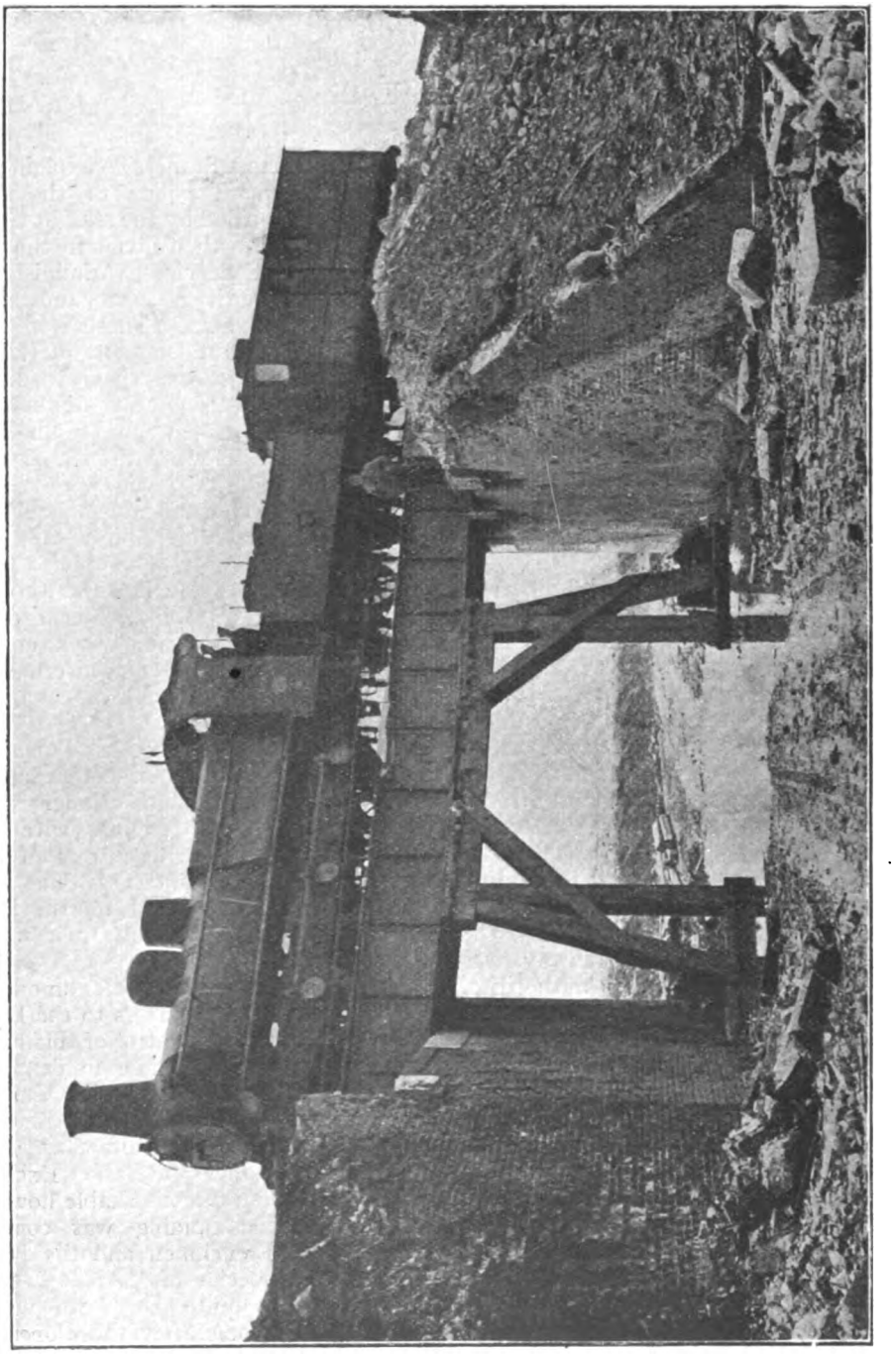

BRIDGE OVER VILLERS CARBONNEL-OMNIECOURT ROAD, CHAULNES-PERONNE LINE, SHOWING OLD BELGIAN ENGINE.

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absolute inadequacy of the existing lines of the Nord Railway to carry the volume of traffic that would be required to pass, and consequently a new line was constructed, leaving the French main line at Candas, south of Doullens, and running through Puchevillers to Acheux. This line was constructed by the British Army and was handed over to the R.O.D. to work. The line was a "single" one, with frequent passing points, and the grades were severe; but a very heavy traffic was dealt with during the Somme offensive with considerable success.

Meanwhile large repair shops were erected at Audruicq, and many more Belgian engines were got ready for work. The old type of Belgian engine, with its large square funnel, was an object of amusement to the British troops; but, for all their queer appearance, these old engines proved to be splendid haulers, though very deficient in brake power. British railways also began to send over some of their goods locomotives, and preparations were made to be ready to meet still further developments.

By this time the importance of railway transportation was becoming more and more realised by G.H.Q., and the visit of Sir Eric Geddes to France still further stimulated the Army chiefs to the necessity of providing adequate transportation facilities. A comprehensive scheme of doubling several single-line sections of the Nord system was agreed upon, and still further British lines were built in the forward areas. In addition to this, large yards or "dumps" were laid out in the Lines of Communication area for the storage of ammunition, which was beginning to arrive in ever-increasing quantities from England. These dumps were all constructed by the British Army, and then handed over to the R.O.D. to operate.

The actual operating practice in the forward areas differed in various districts, and, while the British Army lines were entirely worked by the R.O.D., some of the Nord lines were still left in the hands of that company, the R.O.D. merely providing locomotives, the Nord providing all guards. The following summary of the forward area methods of operation may prove of interest :—

	SECOND ARMY. (April, 1917.)
Hazebrouck–Poperinghe ...	Nord Belge line with British extensions. R.O.D. personnel entirely. Exchange point, Hazebrouck.
Bergues–Proven–Poperinghe... (Under construction.)	British Army line. R.O.D. personnel entirely. Exchange point, Bergues.
Merris–Ouderdom ... ... (Constructing.)	British Army line. R.O.D. personnel entirely. Exchange point, Merris.
	FIRST ARMY.
Bethune–Bully ...	Nord Line. R.O.D. personnel entirely. Exchange point, Bethune.
	FIRST AND THIRD ARMIES.
Ligny St. Flochel–Arras ...	Nord line. Nord station staff. R.O.D. haulage only.
Scarpe Valley Line	British Army line. R.O.D. personnel entirely. Exchange point, Maroeuil.
	THIRD ARMY.
Doullens–Arras	Nord line. Nord station staff. R.O.D. haulage only.
Gombremetz–Acq	British Army line. R.O.D. personnel entirely. Exchange points, Warlincourt and Acq.
	FOURTH ARMY.
Candas–Acheux ... ... (Extended to Achiet-le-Grand.)	British Army line. R.O.D. personnel entirely, as far as Miraumont Junction. Achiet-le-Grand station staff, French. Exchange point, Candas.
	FIFTH ARMY.
Meaulte Area, Peronne, &c. ...	Large group of British Army lines. R.O.D. personnel entirely. Exchange point, Buire.

SUMMARY OF FORWARD AREA METHODS OF OPERATION.

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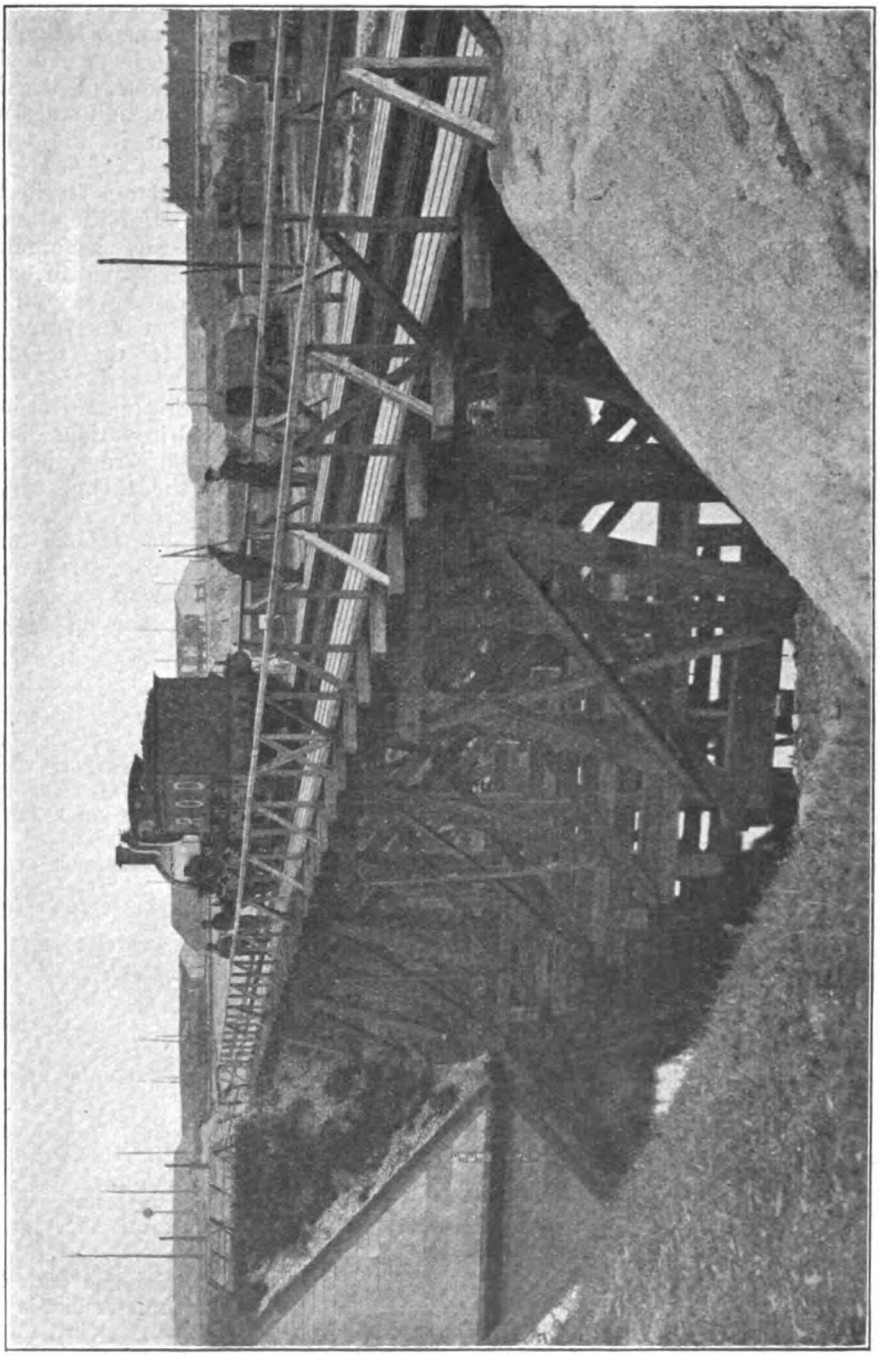

TRESTLE BRIDGE OVER THE CANAL AT DUNKIRK FOR DOUBLING OF LINE BETWEEN WEST SIDE OF DOCKS AND THE TRIAGE DES DUNES, SHOWING MIDLAND 0-6-0 R.O.D. LOCOMOTIVE

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The writer was appointed to take charge of the Ligny-Arras and Scarpe Valley sections in April, 1917, during the battle of Arras, and as all the rest of his time in France was spent in this area, it will be with the working in that section that he will deal with principally in the remarks that follow.

The results of the battle of Arras were far-reaching so far as railway transportation was concerned. Arras station was sufficiently freed from enemy attention to be used in daylight, and it became an important rail-head. Further, the Nord Railway Paris-Lille main line was reopened for traffic between Albert and Arras. *Raccordements* (*i.e.*, facing-point connections completing triangles at converging junctions) were made at St. Pol and Arras, so that the British Army, for the first time, was equipped with a lateral main line from Ypres to Chaulnes, via Hazebrouck, Berguette, Fouquereuil, Pernes, Ligny St. Flochel, Maroeuil, Boisleux, Albert, Longueau. An enormous saving in mileage was also afforded in the transport of coal from the Bethune and Bruay coalfields to Paris, and the consequent result was that the Ligny-Arras line, instead of being merely a "feeder" for the British Army area, became part of an important French main line.

This change naturally led to a modification in the working arrangements. The through Paris coal trains were worked throughout by large "Consolidation" Nord locomotives, and through troop trains were hauled by French engines from Hazebrouck to Longueau, the R.O.D. Ligny engines simply working trains which terminated in the Army area. This class of traffic increased as rail-heads were opened at Boisleux, Achiet and Bapaume, and all supplies for these stations from the northern bases were worked via Ligny and Arras.

In August, 1917, however, the Nord Railway found their difficulties increasing owing to shortage of power, and arrangements were made whereby the R.O.D at Ligny took over all trains except the Paris coal trains, working them as far south as Longueau (a 60-mile haul). The character of the Ligny shed (actually situated at Tachincourt, just east of St. Pol) changed from that of a purely local shed to that of an important main line depôt. The class of engine employed up to that time was the six-coupled goods type—Great Western and Lancashire & Yorkshire engines principally—but as two engines of this type were required to handle a standard train between Ligny and Achiet, several of the new 2-8-0 Great Central type engines, which were just arriving in France, were stationed at Tachincourt. These engines could tackle any British Army train single-handed.

The changed conditions, as will readily be understood, brought the R.O.D. staff in this area into very much greater contact with the French railway people, and a word must be said here in appreciation of the French staff at the Nord Rail ay St. Pol locomotive depôt, who worked most amicably with the R.O.D men at Ligny Control Office. There is no doubt that the friendly feeling which grew up was of material advantage to both parties, and, personally, the writer will always cherish the happiest memories of the working during those months.

The arrival of more big engines from England at once made itself felt. The Nord Railway was at once relieved of all British troop trains, so far as power was concerned, between Hazebrouck and Ligny, so that a troop train from, say, Poperinghe to Chaulnes, would be R.O.D. hauled, at any rate as far as Longueau.

It naturally follows that as the British took over the main line working it became still more essential that there should be co-operation between the R.O.D. staff and the Frenchmen. Up to this period it should be noted that the R.O.D. had only provided locomotives on the Nord main line, and no British guards were employed until later. The two most important junctions in the forward areas up to March, 1918, with which the R.O.D. were concerned, were Hazebrouck and St. Pol, and it was truly remarkable how well the British "Controllers" (N.C.O.'s) picked up sufficient French to enable them to carry on an intelligible conversation with the French staff at the locomotive depôts, who in their turn managed to acquire a smattering of English.

The working during the winter of 1917-1918 was most interesting, but, before dealing with this period, it will be well to recapitulate the grouping of the R.O.D. sections on the lateral main line south of Bethune. From Bethune to Ligny the working was controlled by the French;

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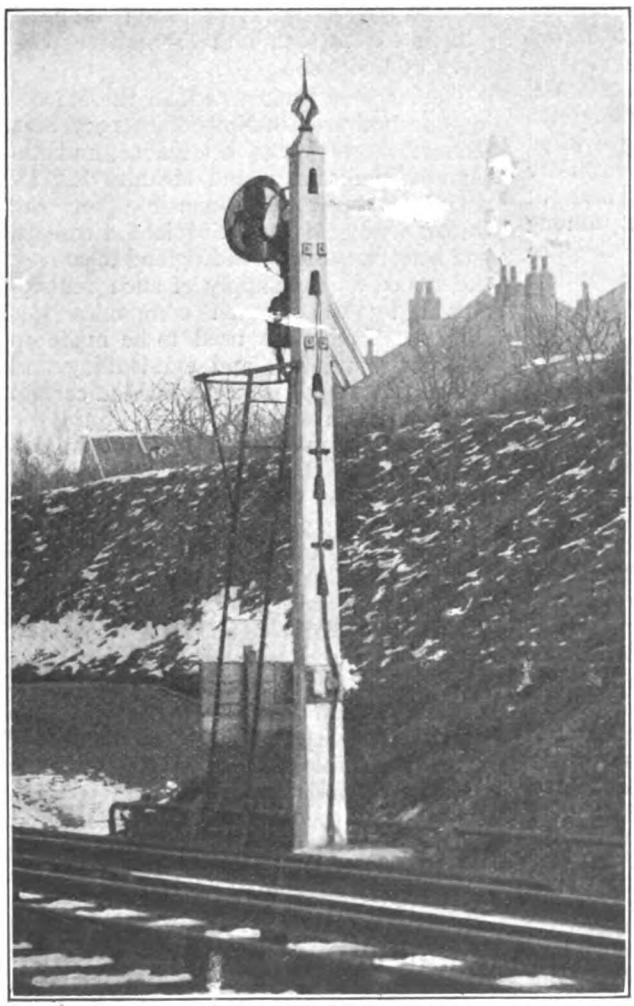
(Second Army) for Italy. These trains were R.O.D.-hauled as far as Longueau. There were thus two important troop movements passing simultaneously, in addition to a greatly-increased supply service. The staff at Ligny, however, proved more than equal to the occasion, and the engine working was arranged so well that all demands were met without putting too great a strain on the locomotive depôt at Tachincourt.

(*To be continued.*)

Concrete Signal Post, Metropolitan District Railway.



CONCRETE and reinforced or ferro-concrete are now being employed for many purposes besides bridges and structures, and a view is reproduced showing a concrete signal post erected on the Metropolitan District Railway. Even although a railway may not be large enough to maintain its own concrete works, there may be distinct economy in purchasing such articles, while there is a further advantage in the fact that renewal is virtually never required, and maintenance cost is practically nil. The post is cored out to lighten it.

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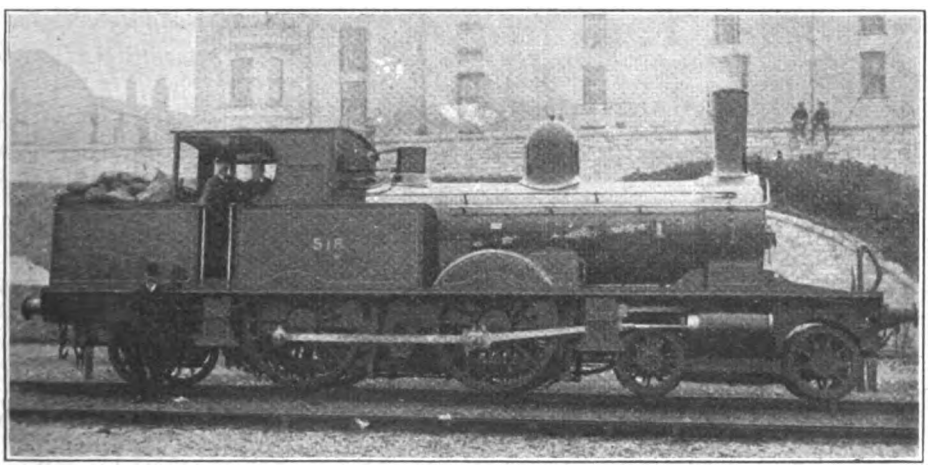
Locomotive and Train Working in the latter part of the 19th Century.

THE LONDON & SOUTH WESTERN RAILWAY. [No. V.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

FOR local train services Mr. Adams introduced new types of tank engines of considerably greater power than those hitherto used, for the latter were of very small size, and though good little engines had become too light for more modern requirements. Tank engine designs by Mr. Adams showed some remarkable contrasts. On the North London Railway in 1868 he introduced the present standard 4-4-0 tank type of that line, with outside cylinders and leading bogie. That the design must have been a good one is shown by the fact that it has never been changed during the last 50 years, except as regards minor details. But when Mr. Adams migrated in 1873 to the Great Eastern Railway he discarded the outside cylinder 4-4-0 type for the 0-4-4 type with inside cylinders and trailing bogie, which had been introduced a short time previously by Mr. S. W. Johnson. Subsequently when he took charge of the South Western locomotive department he returned to his old love, the outside cylinder tank engine with leading bogie. Finally we shall find that in 1888 he again dropped this design for the 0-4-4 type, which he used on the Great Eastern.

The first Adams tank engines on the South Western had outside cylinders and leading bogies, and were of the 4-4-0 design. There were 12 of these built by Beyer, Peacock & Co., in 1878–9, with coupled wheels, 5 ft. 7 in. diam., cylinders, 18 in. by 24 in., and side tanks. As regards general dimensions and the boilers they were identical with the first mixed traffic tender engines, Nos. 380 to 391 already referred to, and like these, had solid centre bogie wheels 2 ft. 6 in. diam. They suffered from insufficient coal capacity and, moreover, were somewhat difficult to coal, so that between 1883 and 1886 they were altered to 4-4-2 engines by the addition of a larger bunker and a radial trailing axle. These engines, Nos. 46, 123, 124, 130, 132, 133 and 374 to 379,



4-4-2 TANK ENGINE NO. 518.

Designed by Mr. W. Adams and built by Messrs. Dübs & Co., 1885.
Cylinders, 17½ in by 24 in. Coupled wheels, 5 ft. 7 in. diam.

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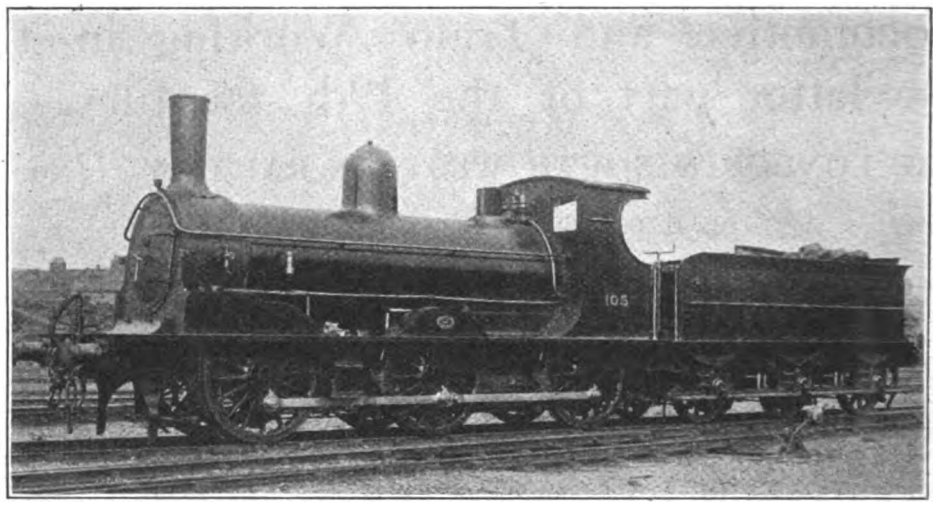

0-6-0 GOODS ENGINE NO. 105.

Designed by Mr. W. Adams and built by Neilson & Co., 1881–6
Cylinders, 17½ in. by 26 in. Coupled wheels, 5 ft. 1 in. diam.

remained at work in the London area until after the war broke out, and some are still in service in various districts. They have undergone no further alterations, except the addition of chimneys of Mr. Drummond's design.*

This design was not, however, repeated, and the standard tank engines from 1882 to 1885, of which no less than 71 engines were built by Beyer, Peacock & Co. (12), Stephenson & Co. (28), Dübs & Co. (20), and Neilson & Co. (11), were of the 4-4-2 type, in which most of the water was carried in back tanks, the side tanks being of very small capacity. The size of the outside cylinders was reduced to 17½ in. by 24 in., the coupled wheels were of the same diameter, 5 ft. 7 in., as in the previous class; but the bogie wheels were increased to 3 ft. diam., and had spokes instead of solid centres. The total wheelbase of these engines was 29 ft. 5 in., and they weighed 52 tons in working order, of which 29 tons 16 cwt. rested on the coupled wheels. The engines built in 1882–4 were mostly stationed in the London district, where they gradually replaced the Beattie tank engines. The 10 Stephenson's engines of 1885 found their way to certain of the country branches, *e.g.*, No. 67 (afterwards renumbered 58) began work on the Wareham and Swanage branch. The last 10 of this class, Nos. 516 to 525, built by Dübs & Co. in 1885, worked the Waterloo and Reading service for some time, and several of the Stephenson engines were stationed at Twickenham. During later years many of them have drifted away from London into other districts, but a large number were to be seen in the Metropolitan area until the electrification of the suburban lines dispossessed them of their usual home.

Some very smart work with fast suburban trains in the London area was performed by these engines in the last years of the century, more especially on the Aldershot and Farnham trains. One of the morning up trains was booked from North Camp to Vauxhall, 31¼ miles in 40 min., leaving the former station at 10.22 a.m. and arriving at Vauxhall at 11.2 a.m. This gives a running average of nearly 46·9 m.p.h. Starting from Farnham there was a stiff pull up to the tunnel under Fox Hills and thence down to Pirbright Junction on the main line. The 10.19 a.m. from Brookwood was due at Vauxhall at 10.53 a.m., a timing of 34 min. for the 26¾ miles, or a speed of 47¼ m.p.h. There were also one or two runs to Woking from Waterloo which, though not so fast as the above, were very creditable performances.

* I understand that some of these engines were sent to the "Near East" during the War. A number of Mr. Adams's goods engines also rendered service in Egypt and Palestine.

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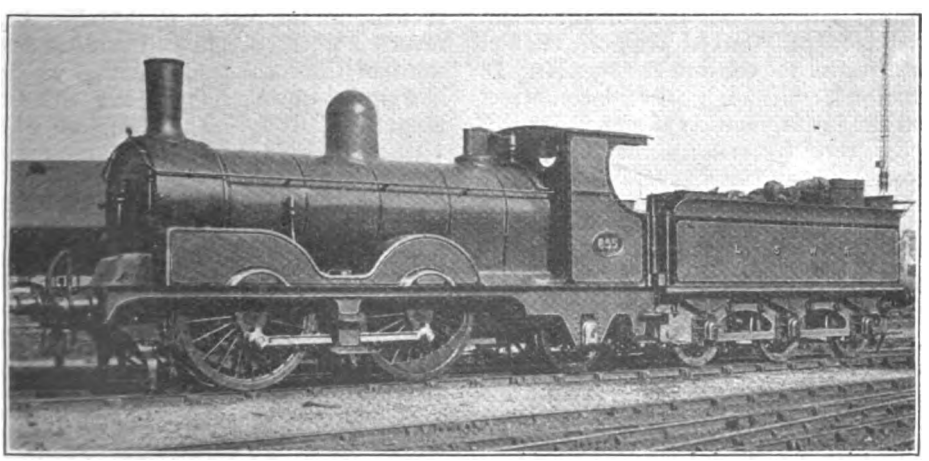
During the same period Mr. Adams decided to convert some of the older Beattie 2-4-0 tank engines to tender engines for service on some of the country branches, and to this end altered 30 of them. Many were rebuilt with new boilers in 1884 to 1887, the 1884 rebuilds having round-topped domes of polished brass. A few of these converted tender engines retained the old Beattie boilers. The cylinders were 16 in. by 20 in., and consequently the engines were not very powerful, though probably large enough, for much of the branch line traffic of those days. These engines worked the Wilts and Dorset line (Salisbury and Wimborne), also the Salisbury and Southampton service, and were frequently to be seen on slow trains between Southampton, Wimborne and Weymouth. They had about ten to twelve years life on these duties, and most of them disappeared during the later years of last century.

I have already mentioned that Mr. Adams did not venture into the design of six-coupled goods engines with outside cylinders, and his goods engines, of which there were 72, all constructed by Neilson & Co. in 1881 to 1886, were of one standard class. They are simple, straightforward engines with cylinders 17½ in. by 26 in., and coupled wheels, 5 ft. 1 in. diam., a total heating surface of 1,176½ sq. ft., and weighed 38 tons 16 cwt. in working order.

In 1887 Mr. Adams caused somewhat of a surprise in locomotive circles by abandoning outside cylinders for all classes except express engines, and beginning to build a large number of mixed traffic engines of the 0-4-2 type with 6 ft. 1 in. coupled wheels in front and 18 in. by 26 in. cylinders. These engines were then known as the "Jubilees," since the first 10 of them were built at Nine Elms in 1887. The total heating surface was 1,248·1 sq. ft., towards which the firebox contributed 116·7 sq. ft. The trailing axleboxes have outside bearings, and in the first 30 of the class, Nos. 527 to 556, the cylinders were designed with valves underneath, though No. 527 was subsequently modified to have new cylinders with the steam chests between them. When they were new Nos. 527 to 536 were frequently to be seen on the Waterloo and Reading train service, and subsequently many of them were employed on the Portsmouth "direct" passenger trains. The later 50 engines of the class, Nos. 607 to 646, by Neilson & Co., in 1892–3, and Nos. 597 to 606, 647 to 656 built at Nine Elms in 1893–5, have steam chests between the cylinders as in the modified No. 527.

It may be observed that with the appearance of the No. 527 class in 1887, the construction of new engines was again given to Nine Elms Works which, since January, 1875, had been entirely devoted to rebuilding and repairs. During this interval all new engines for the South Western had been constructed by private



0-4-2 MIXED TRAFFIC ENGINE NO. 655.
Designed by Mr. W. Adams and built at Nine Elms, 1895.
Cylinders, 18 in. by 26 in. Coupled wheels, 6 ft. 1 in. diam.

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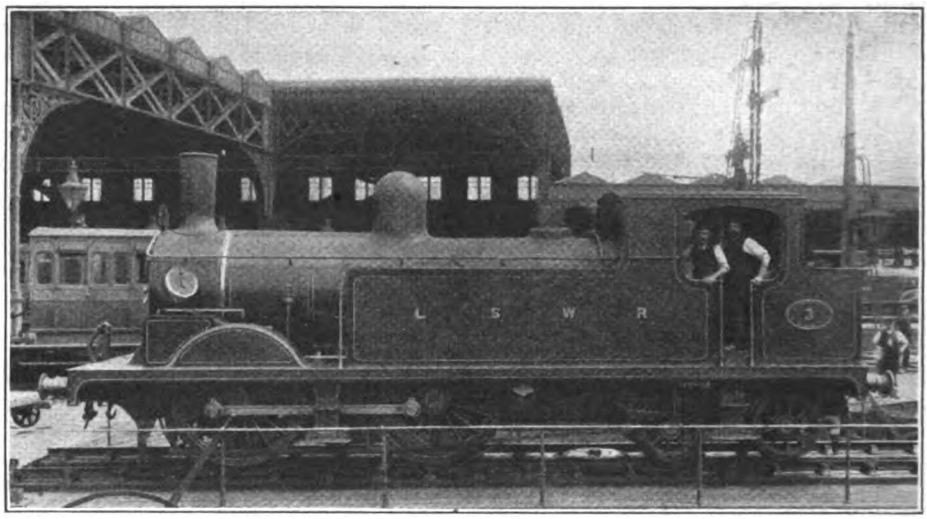

Photo.] **0-4-4 TANK ENGINE NO. 3.** [*Loco. Publishing Co., Ltd.*

Designed by Mr. W. Adams and built at Nine Elms, 1894.
Cylinders, 18 in. by 26 in. Coupled wheels, 5 ft. 7 in. diam.

firms. Another point of interest in South Western locomotive practice was the permanent adoption of the "mixed traffic" engine, with four coupled wheels of moderate diameter, and for many years no more six-coupled engines were built. The South Western, like the other southern railways, is more particularly a passenger line, and it is obviously economical in engine-power to have locomotives capable of working passenger trains, other than the fastest expresses, in one direction and returning with a goods train in the other. This policy of "mixed traffic" engines was afterwards continued by Mr. D. Drummond, although the locomotives which the latter engineer designed for this purpose were of quite a different type to those of Mr. Adams.

The reversion to inside cylinders for the "mixed traffics" was followed by a swing of Mr. Adams's pendulum to the same side for his passenger tank engines, and from this time the outside cylinder tank engine completely disappeared from South Western locomotive designs. The new tank engines were of the 0-4-4 type with inside cylinders, and from 1888 to 1890, 20 of them, Nos. 61 to 80, were built at Nine Elms, followed in 1894–6 by 30 more, Nos. 1 to 20 and Nos. 358 to 367. These engines have 5 ft. 7 in. coupled wheels with 18 in. by 26 in.-cylinders, and have many details in common with the "mixed traffics" of the No. 527 and 607 classes. They have generally been used on the London suburban services, but were also employed to a considerable extent on the main lines west of Exeter. At the end of 1889 a smaller class of 0-4-4 passenger tank engine appeared, and between that date and the spring of 1895 60 of these engines, Nos. 177 to 236, were built at Nine Elms. The new engines, which were intended for branch lines all over the system, are interesting in that Mr. Adams reverted to the design and leading dimensions of the local tank engines which he had built during 1875–8 for the Great Eastern Railway. The coupled wheels, 4 ft. 10 in. diam., were the same on both railways, and the cylinders, 17½ in. by 24 in., were also those of his 1877–8 engines on the same railway. A few of the South Western 177 class are to be seen in the London district, notably on the Clapham Junction and Addison Road local service and on empty train work at Clapham Junction; but most of the class are now and have generally always been used on the branches away from the London area.

In 1888 occurred one of those changes that had a far-reaching effect on the express services on the southern section of the South Western Railway. This

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was the opening of the direct route to Bournemouth, which took the form of a short cut from Brockenhurst to Christchurch. Previously most of the Bournemouth fast trains were combined with the Weymouth trains, and were detached at Ringwood Junction on the old main line, whence, at one time, they travelled to Bournemouth (East), the distance from Waterloo being about 116 miles. On the other side of Bournemouth there existed Bournemouth West Station, which connected with the old main line at Poole Junction, the latter station being subsequently renamed Broadstone Junction. Bournemouth West served for local connecting trains from Wimborne and Poole Junction, and from 1880 took on a much greater importance when the first of the through Midland expresses from the north used the Somerset and Dorset Joint Railway between Bath and Wimborne. A connecting line was made between Bournemouth East and West Stations, and afterwards the former was enlarged and renamed Bournemouth Central. Finally, the new line from Brockenhurst, mentioned above, reduced the distance from Waterloo to Bournemouth to 107½ miles. For some time, however, after the opening of the new line, the speed allowed over it was limited owing to the very treacherous material which formed the Sway bank, over which the speed had to be reduced to 20 m.p.h.

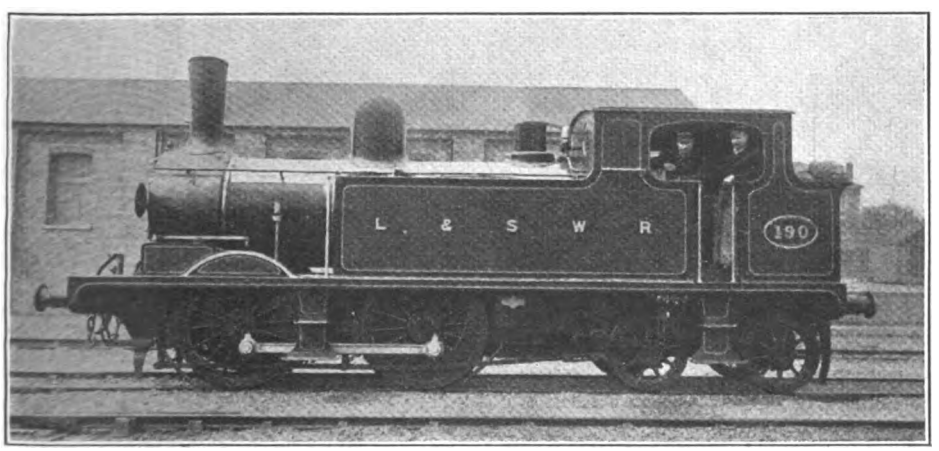
Nevertheless, the new line was instrumental in being the cause of the best South Western express, the 12.30 p.m. from Waterloo which, in 1888, was timed as follows :—

Miles.		Arr.	Dep.	Speed.
	Waterloo		12·30	
79	Southampton West	2·9	2.11	48
92½	Brockenhurst	2·28	2·30	47¾
107¼	Bournemouth (C.)	2·57		32¾

This train was worked by the Adams engines of the 450 and 460 classes, with 18 in. by 24-in. cylinders. A modification took place in the working in that Weymouth carriages were now generally detached at Brockenhurst instead of at Ringwood as previously.

But although the Bournemouth service was so greatly improved in the matter of speed, the service to Exeter and the West showed a sad falling off in the summer of 1888, a year which was the culminating point of a series of "decelerations." In the late seventies the best express reached Exeter in slightly over four hours for the 171½ miles, and this timing was practically maintained for the 2.30 p.m. down as previously given. But in July, 1888, the company could manage only 4 hours 12 min. for the best Exeter express, the following timing of which is taken from "Foxwell's express trains" :—

Miles		Arr.	Dep.	Speed.
	Waterloo		11.0	
83½	Salisbury	12·57	1·5	42
112	Templecombe	1·44	1·49	44
171¼	Exeter (Wt. Plat.)	3·9	3·11	44·6
171½	Exeter (Q. St)	3·12		



0-4-4 TANK ENGINE NO. 190.

Designed by Mr. W. Adams and built at Nine Elms, 1895.
Cylinders, 17½ in. by 24 in. Coupled wheels, 4 ft. 10 in. diam.

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There were two trains at the same speed, the other being the 2.30 p.m. down. The peculiarity of the timing lay in that the better speeds were performed over the much steeper section between Salisbury and Exeter, and that the timing from Waterloo to Salisbury was an unaccountably poverty-stricken performance. Compared with the 2.30 p.m. down of five years earlier the latter took only 4 hours 1 min. from Waterloo to Exeter ticket platform, with five intermediate stops totalling 14 min., whereas the later best expresses of 1888 required 4 hours 9 min. between the same points with two stops, though in the latter case the station work consumed 13 min. That things were getting to a pretty pass must have been realised, for in October, 1888, somebody woke up and made the Exeter timing for the afternoon express from Waterloo an even four hours.

Probably one of the reasons for the slackness was the poor competition of the Great Western. This latter company had a considerable disdain for the humble third-class passenger; in 1888 its best trains to Exeter and Plymouth were first and second-class only, and third-class passengers came in a very bad third indeed. The South Western, to its credit be it said, carried third-class passengers by all trains, with the result that they landed these individuals in Plymouth 15 min, before the Great Western did so. The distance was 17 miles less by the South Western route, but the road was much harder. Another possible reason for the decreased speeds was that the trains were certainly becoming much heavier. On the other hand the South Western shared to some extent in the sins of its southern neighbours, for punctuality was not a very strong point with the company, though the trains never, within my own knowledge, descended into the nethermost depths in this line of business to which the South Eastern and the Brighton lines were so extremely partial in those days. However, they were bad enough, more especially many of the up trains, which suffered from the crowded state of the lines between Farnborough and London.

(To be continued.)

ON THE BORDER OF ASIA AND AFRICA.

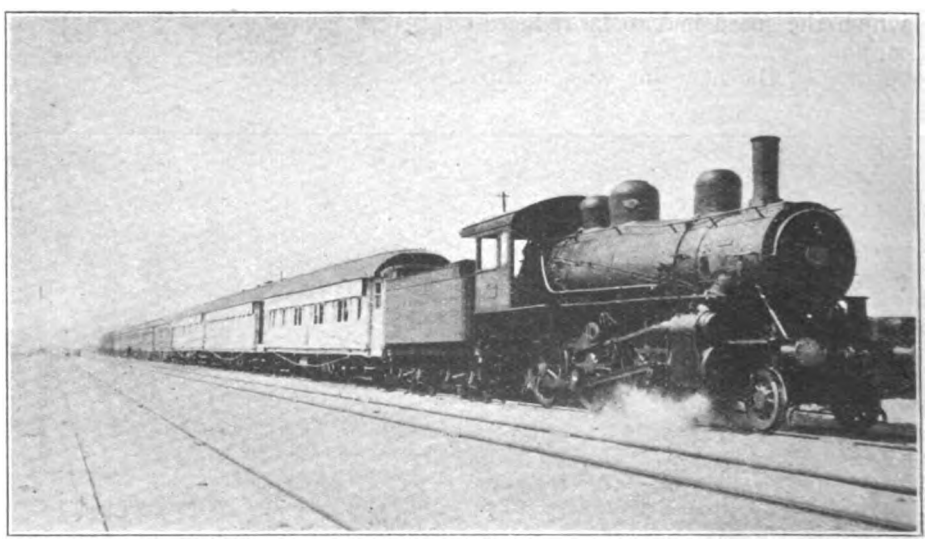

Photo.] [*W. A. Millar.*

A VIEW ON THE PALESTINE MILITARY RAILWAY AT RAFA, ON THE BORDER BETWEEN AFRICA AND ASIA.

Haifa-Jerusalem train, Baldwin 4-6-0 locomotive No. 890.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst. T.

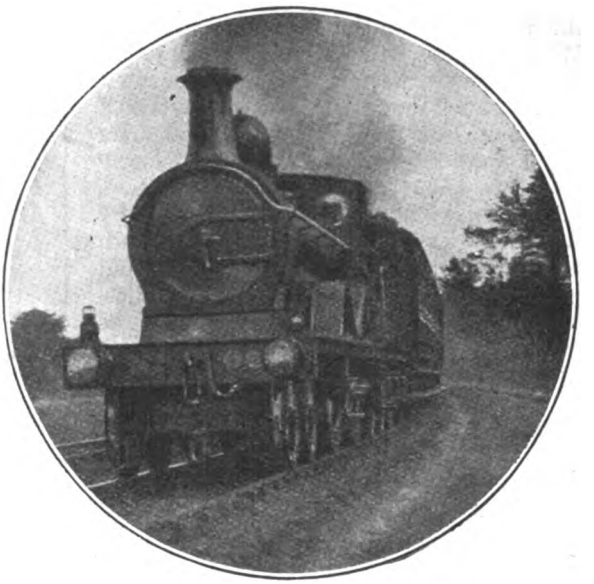

Photo.] [*E. A. Gurney-Smith.*

GREAT NORTH OF SCOTLAND RAILWAY.

2.30 p.m. Aberdeen–Inverness Express passing Pitmedden at full speed. 4-4-0 engine, No. 106.

SOME time ago I promised that in a future article I would include a diagram showing how the amateur recorder of runs might ascertain for himself the tare loading of the trains by which he travels, and thereby substitute fact for the distinctly wild estimates of train weight that sometimes reach me in the logs forwarded by correspondents. That diagram is reproduced herewith, and accompanying it an explanatory table, concerning which I have a few remarks to make. The letters in the second column indicate the position on each coach in which the particulars of the weight may be found, in accordance with the corresponding letters in the sketch. In the third column will be found details as to whether the tare is given at one or both ends of each vehicle; in point of fact, the Midland Company alone adopts the somewhat inconvenient practice of showing the tare weight at one end of the coach only. This means that the whole of the coach weights in a train cannot be read "facing" when one is walking down the train, it being necessary to turn and read some in a backwards direction. In my own experience I find it rather easy thus to miss out the weight of a coach, when the figures relating to two adjacent coaches face each other across the buffers. Most companies, if they do not give the weights at all the four corners of each vehicle, show the weight once at each end, always in the same relative position, left or right hand, so that all the weights are facing the recorder as he walks up or down the train, as the case may be. The most lavish indications occur on the North Eastern Railway, where the weights are given not only at all four corners of each vehicle, but on both sides above the footboards as well. On the contrary, a few of the North Eastern-built Great Northern and North Eastern Joint vehicles have the weights above the footboards only, in position "K."

In the next column I have described the detail in which the weights are given, most companies showing the nearest ton only, whereas others descend to hundredweights, and the South Eastern and Brighton show quarters as well. Next comes the type of indication adopted, as a guide to the reader. The most difficult of all the indications to decipher are generally those which are merely figures painted on in white; these often get so dirty, especially when painted on the

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sole-bar, as to be well-nigh illegible. When this is the case on the Brighton and South Western lines, the small gas pressure gauges above the footboard may be used as a "clue," and the tare weights, which are inscribed in rather unnecessarily small characters, will be discovered closely adjacent. The large white block figures adopted by the North Western are by far the easiest type of indication to read, and at any time my own preference would be for the figures on the ends of the coaches, about 3 ft. above platform level, as distinguished from those placed immediateately below the roof. Those on the sides of the coaches, above the footboard, are always the hardest to read, especially when the carriage, body overhangs the sole-bar, as often on the Great Western, or when the distance between body and footboard is very limited, as in the new Great Central stock, or at any time when all the carriage doors are open.

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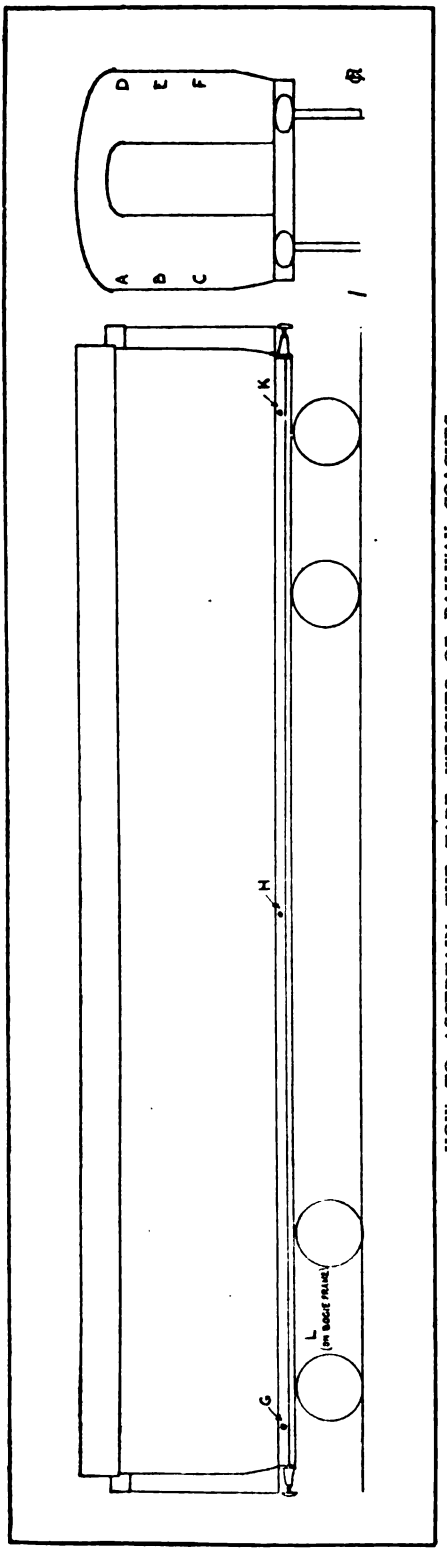

HOW TO ASCERTAIN THE TARE WEIGHTS OF RAILWAY COACHES.

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G.W.R.	G	,,	T.C.	Painted figures.. ..	,,
G. and S.W.R.	C	,,	Tons	White enamelled plate	Black.
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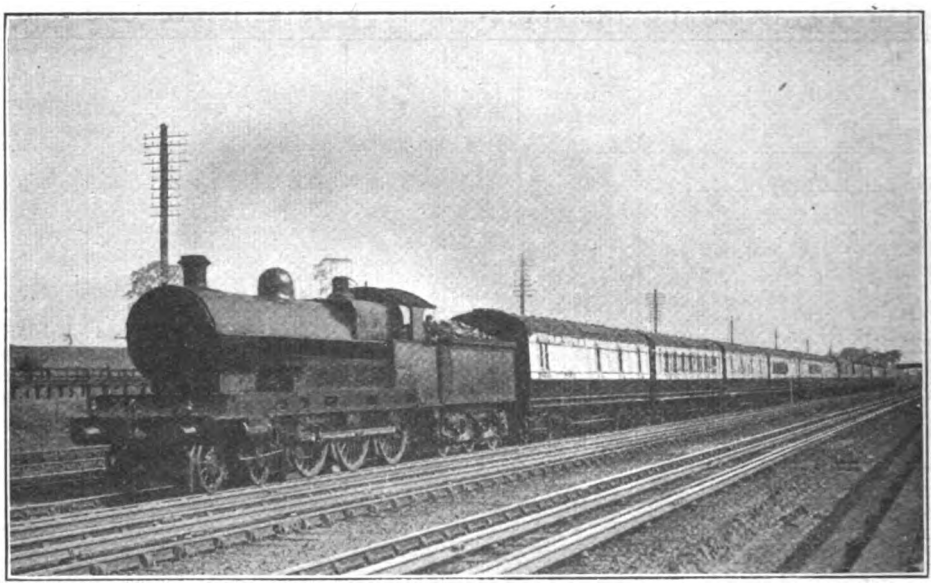

Photo.] LONDON & NORTH WESTERN RAILWAY. [*F. E. Mackay.*

Down Liverpool express near Wembley. Four-cylinder 4-6-0 locomotive, No. 1334 ("Claughton" class).

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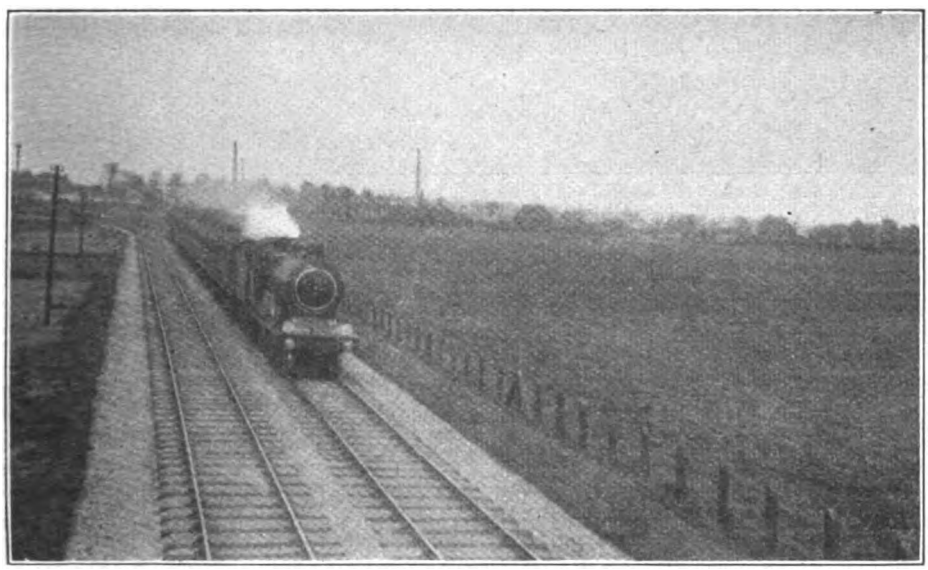

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Down Newmarket Race Special near Coldham Lane, Cambridge. Superheater 4-6-0 locomotive, No. 1530.

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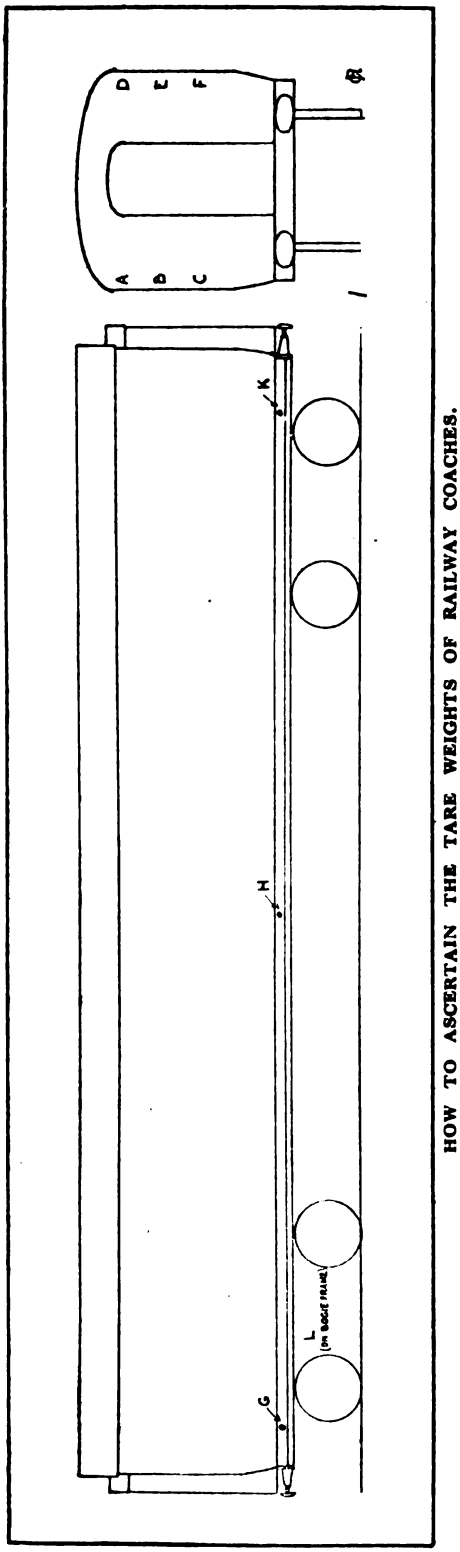

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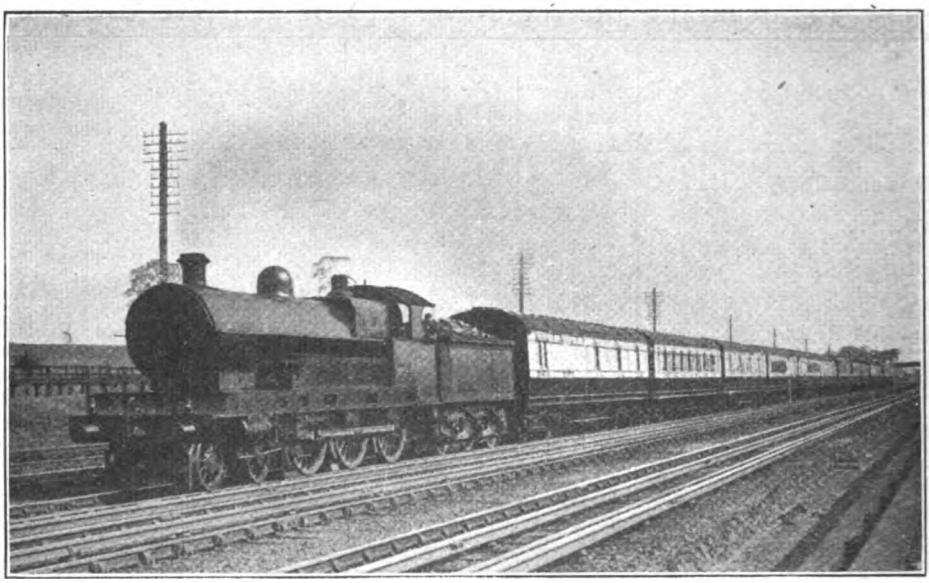

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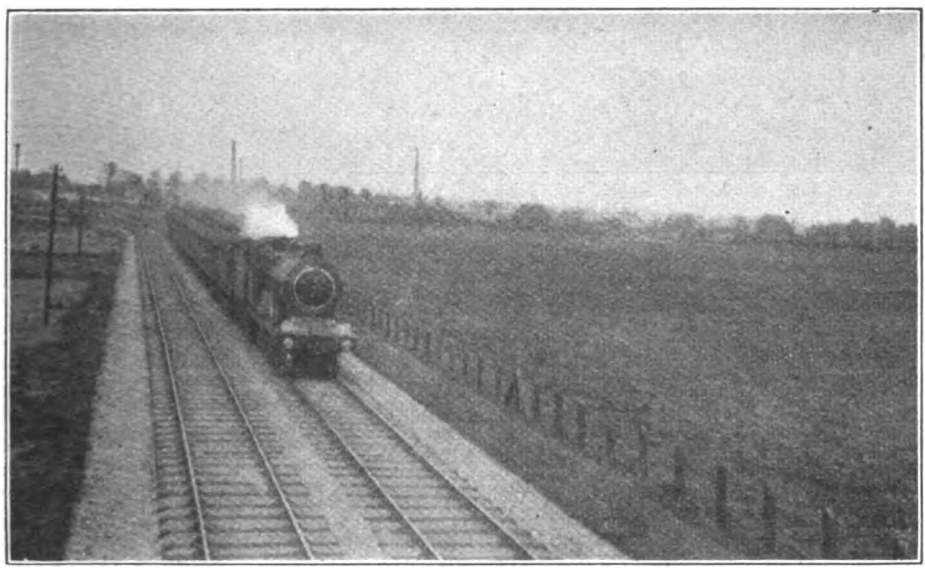

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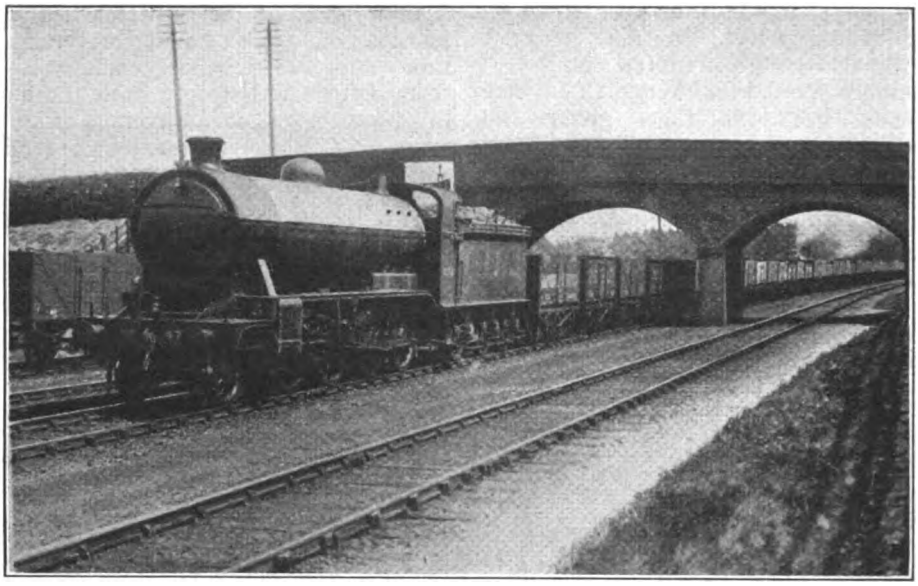

Photo.] **GREAT NORTHERN RAILWAY.** [*R. Hall.*

2-8-0 locomotive, No. 474, on train of coal empties.

the tunnel at 53, we touched 64 m.p.h. before stopping at Rochdale, 8.7 miles, in precisely 12 min., instead of the 13 min. allowed. Littleborough, 5·3 miles, was passed in 8¼ min. After leaving Rochdale we again suffered a signal check, beyond Castleton, but passed Middleton Junction, 5·2 miles, in 7 min. 20 sec., and not exceeding 61 m.p.h. on the subsequent sharp descent, reached Manchester Victoria, 10·6 miles, in 14½ min. (allowed 15). Net times were 11 min. from Todmorden to Rochdale, and 13½ thence to Manchester, the engine having therefore gained no less than 8½ min, in running between Wakefield and Manchester.

As a typical example of the smart running between stops so characteristic of the Lancashire and Yorkshire Railway, let me cite a trip on the 9·55 a.m. train from York to Manchester, when the load out of York was 135 tons, the engine "Atlantic" No. 711, and the start 13 min. behind time. First we passed Bolton Percy, 7·7 miles, in 10 min. 10 sec., at 64 m.p.h., and despite a preliminary slack to cross over from the north to the south lines before Church Fenton, stopped at the latter station, 10·7 miles, in 13 min. 50 sec., although allowed 16 min. Restarting, we passed Burton Salmon, 6 miles, in 8¼ min. (slacking slightly over the junctions at Milford), and reached Castleford, 10.2 miles, in 13 min. 35 sec., again instead of 16 min. The 3·5 tortuous miles thence to Normanton occupied 6 min. 35 sec. (allowed 7 min.), and the 3·1 miles on to Wakefield, 6 min. 20 sec., in both cases start-to-stop, the slight excess over the 6 min. allowance in the latter instance being due to a severe signal check before the stop. Leaving Wakefield with 125 tons, we reached Horbury, 3·9 miles, in 6 min. 25 sec., and cleared that station in 7 min. 5 sec., practically as booked; from there the 3·1 miles' run to Thornhill occupied 5 min. 40 sec., and we cleared the latter station in 6 min. 20 secs. instead of 7 min. From Thornhill we covered the 6·5 miles to Brighouse in 10½ min., thereby gaining 1½ min., but almost the full schedule time was taken for the 5·7 miles thence to Sowerby Bridge, which occupied 8 min. 55 sec. Sowerby Bridge to Hebden Bridge, 5 miles, took 8½ min., and we cleared this station in 9 min. instead of 10. From Hebden Bridge we passed Todmorden, 4.5 miles, in 7 min. 50 sec., but fell to 37½ m.p.h. at Summit Tunnel; Littleborough, 9·8 miles, was passed in 15 min. 20 sec., however, at 60 m.p.h., and Roch-

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dale, 13·2 miles, was reached in 19 min. 20 sec., the allowance being 20 min. At Rochdale the load was made up to seven 8-wheelers, or 180 tons gross, and we passed Middleton Junction, 5·2 miles, in 7 min. 20 sec., not exceeding 64 m.p.h. on the falling grades, and reached Manchester in 14 min. 20 sec., the schedule in this case being 16 min. In consideration of the intermediate grades, the running made by No. 711 was really good throughout, and the aggregate gain to engine was over 10½ min. Owing to overtime spent at stations, however, our arrival was still 5¾ min. behind time.

With the 5·25 p.m. express from Manchester to Leeds I have had a large number of runs. This is always a substantial corridor train of eight vehicles, including restaurant car, very well filled, and weighing empty 220, and full about 235 tons. It is also almost invariably "Atlantic"-hauled. For some time past, in consequence of the time lost between Manchester and Todmorden, principally on the tremendous 9½-mile ascent out of Manchester (on which we "stuck" on two occasions), the train has been piloted regularly over this length, the train 4-4-2 being headed variously by a large or small-wheeled 4-4-0, a 0-6-0 goods, or even on occasion a 2-4-2 tank engine. I will content myself with describing five of these journeys.

As a preliminary, it may be remarked that the rise from the start just mentioned varies in steepness from 1 in 150 up to 1 in 63 for the first 2½ miles, there being all but a mile at the latter inclination, a portion of which commences practically at the platform end; then from Newton Heath ensues a stretch at 1 in 150 past Moston for 2¾ miles, almost to Middleton Junction, followed, after a level strip of 1¼ miles, by a further length at 1 in 152 for 2¾ miles up to Castleton. Of the 8 miles remaining from Castleton to the Todmorden end of Summit Tunnel, the whole, save 2¼ level miles forward from Rochdale, are inclined upwards at 1 in 330. This is, therefore, a terribly formidable start for east-bound trains.

Before the commencement of the piloting to which I have referred, 4-4-2 No. 1408 did well with the standard load to pass Newton Heath, 2·8 miles, in 8 min. 20 sec.; Middleton Junction, 5·4 miles, in 12 min. 35 sec.; Castleton, 9 miles, in 17 min. 40 sec.; and Rochdale, 10·6 miles, in 20 min. 20 sec.; approaching the latter station, also, we were badly slacked in order to take the loop instead of the straight road. Further signal checks ensued at and beyond Littleborough, so

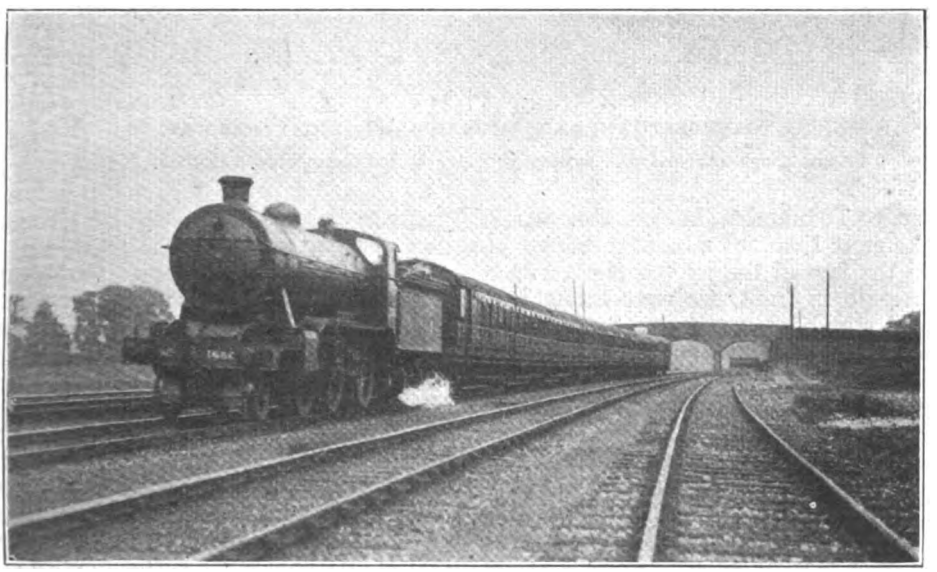

Photo.] **GREAT NORTHERN RAILWAY.** [*R. Hall.*

4·15 p.m. down train ex King's Cross. 2-6-0 locomotive, No. 1660.

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that our time to Todmorden, 19·3 miles, was 33 min. 55 sec.; unchecked I believe we should have kept the exceedingly difficult 30-min. schedule, as our net time to Rochdale was less than a minute over the allowance. No. 708 made an even better start, on a very wet night, passing Newton Heath in 7 min. 10 sec., Middleton Junction in 11 min. 20 sec., Castleton, where we had a slight signal check, in 17 min., and Rochdale, where adverse signals brought us down to 30 m.p.h., in 19 min. 35 sec. Signals at Littleborough again delayed us, and we thus took 32 min. 50 sec. to Todmorden, but net time would not be more than 29½ min. at most.

On the first of the piloted trips, with a 6 ft. 4-4-0 in front, we were brought to a dead stand for 2 min. on the bank at Cheetham Hill Junction, but still contrived to pass Newton Heath in 8 min. 35 sec., Middleton Junction in 12 min. 25 sec., Rochdale in 19¼ min., and Littleborough, 14 miles, in 23 min. (maintaining 56½ m.p.h. on the 1 in 330), reaching Todmorden, after a slight preliminary signal check, in exactly 30 min. Net time on this remarkable trip was not more than 26 min. No. 1423, similarly piloted, passed Newton Heath in 7 min. 10 sec., Middleton Junction in 11 min. 20 sec., Castleton in 16 min. 35 sec. (with a slight signal check), Rochdale in 18 min. 50 sec., Littleborough in 22 min. 35 sec., and reached Todmorden in 29½ min., or 29 min. net. The same engine and pilot, on another occasion, had the load increased to 38 axles, or 260 tons, and passed Newton Heath in the excellent time of 6 min. 50 sec.; subsequent times were 11 min. 25 sec. to Middleton Junction, 16 min. 40 sec. to Castleton (a bad signal check here), 19 min. 25 sec. to Rochdale, 23¼ min. to Littleborough, and 30 min. 35 sec., or 29½ min. net, to Todmorden.

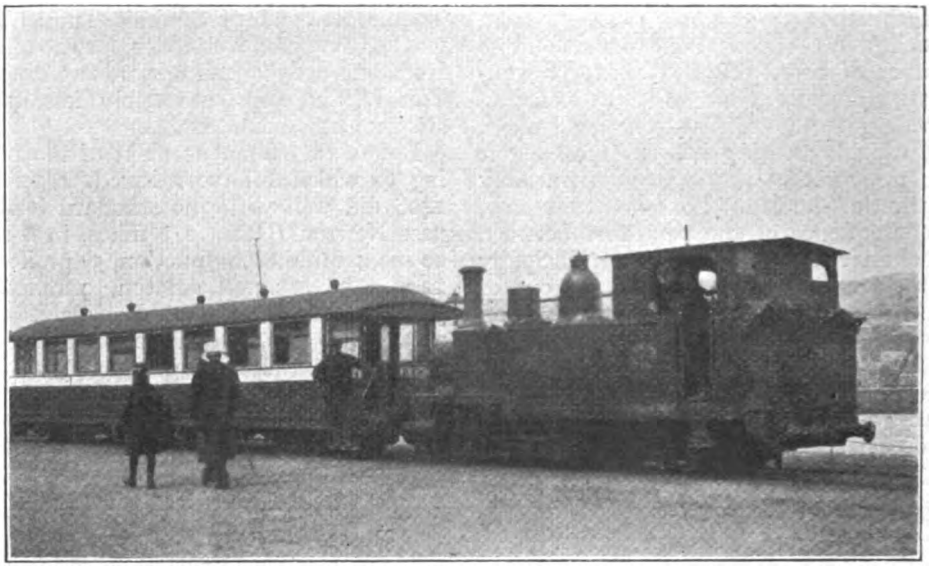

Photo.] [*E. A. Gurney-Smith.*

CAMPBELTOWN AND MACHRIHANISH LIGHT RAILWAY.

2 ft. 3 in. gauge train and tank locomotive "Argyle" at Campbeltown Harbour, Kintyre.

From Todmorden there is, of course, a splendid start down to Sowerby Bridge, although little advantage is generally taken of the falling grades owing to the winding character of the line. From Milner Royd Junction the line rises at 1 in 156–91 for ½-mile, and then at 1 in 118 for 2½ miles, to Halifax, but as the junction is well laid out for speed, and is generally taken at about 55 m.p.h. in this direction, the concluding bank can be partly "rushed." The only really fast running over this length was made on the first of the five runs, when No. 1408 passed

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Hebden Bridge, 4·5 miles from Todmorden, in 6 min., and Sowerby Bridge, 9·5 miles, in 10½ min., speed twice touching 70½ m.p.h. between the latter stations; despite a slight signal check outside Halifax we stopped in 15 min. 40 sec., or 15½ min. net, the distance being 13·1 miles, and the allowance 18 min. No. 708 did not exceed 64½ m.p.h., passed Hebden Bridge in 6 min. 20 sec. and Sowerby Bridge in 11 min. 25 sec., reaching Halifax in 17 min. No. 1422, having dropped the pilot at Todmorden, passed Hebden Bridge in 6 min. 35 sec., and Sowerby Bridge in 11 min. 25 sec., also touching 64½ m.p.h., and reached Halifax in 17 min., again after a slight signal check—16¾ min. net. No. 1423, passing Hebden Bridge in 6 min. 40 sec. and then attaining 65 m.p.h., was checked to 45 m.p.h. by signal at Sowerby Bridge, breasting that station in 11¾ min., and stopping at Halifax in 17 min. 20 sec., or 16½ min. net. The same engine with the 260-ton train passed Hebden Bridge in 6½ min. and Sowerby Bridge in 11 min. 35 sec., after touching 64 m.p.h., and arrived at Halifax in 17 min. 5 sec. Each of the drivers "eased" to about 55–50 m.p.h. over Milner Royd Junction.

For the 5·2 miles from Halifax to Low Moor, commencing with 2¼ miles up at 1 in 200–236, 8 min is an impossible allowance with such a load; our respective times were 9 min. 10 sec., 9¼ min., 9½ min., 10 min., 20 sec. (delayed by signals), and 9 min. 10 sec. All were in the circumstances good, and especially the last, with the extra coach. As regards the remaining short stretch into Leeds, a speed restriction to 20 m.p.h. is enforced at Bowling Junction, and, after the 1 in 150 ascent has been negotiated from there to Laisterdyke, another of 10 m.p.h. at the latter place, so that, even allowing for the continuous descent from Laisterdyke to Holbeck, a schedule of 18 min. for the 10·5 miles from Low Moor to Holbeck would not seem to leave much to spare. Nevertheless No. 1408, now hauling 135 tons only, after the loss of the Bradford portion at Low Moor, completed the distance in 15 min. 10 sec., passing Bowling Junction, 1·7 miles, in 3 min. 35 sec., and Laisterdyke, 3·6 miles, in 6 min. 25 sec.; maximum speed on the subsequent descent was kept down to 64 m.p.h. No. 708 observed the junction speed orders rather more rigorously, and passed Bowling Junction in 4¼ min., and Laisterdyke in 7 min. 35 sec., reaching Holbeck in 16 min. 10 sec. Maximum

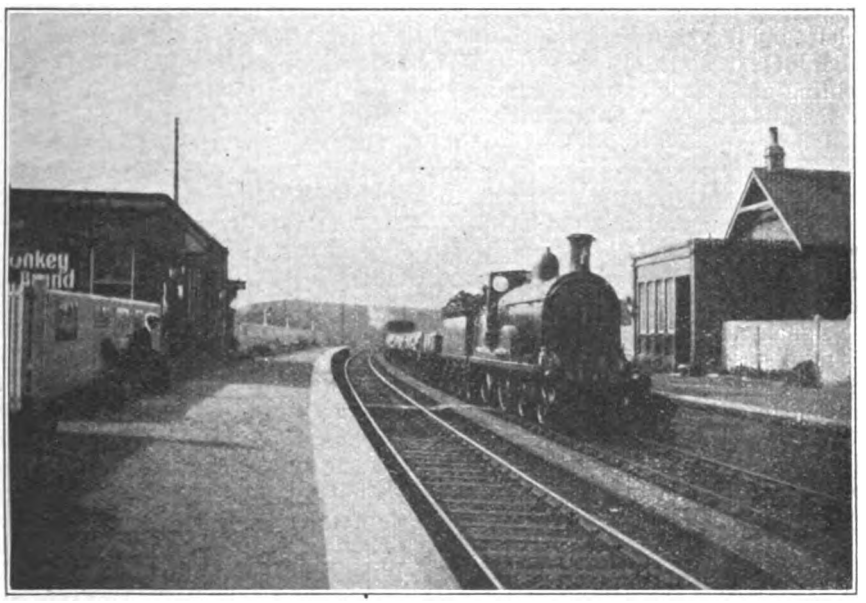

Photo.] NORTH BRITISH RAILWAY. [*T. M. L. Neish*

Goods train passing St. Fort, hauled by 4-4-0 locomotive.

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speed was also 64 m.p.h. on this run. Of the remaining runs, I only recorded No. 1423's first effort beyond Low Moor; the times were 4 min. 10 sec., 7 min. 25 sec. and 16 min. respectively, with a top speed of 64½ m.p.h.

And now, lastly, for some runs west of Manchester, where, on the trains to and from the coast, some considerably heavier loads may be met with. Of the best Blackpool trains, the 4·55 p.m. *ex*-Victoria has the smartest timing by 4 to 6 min. to Kirkham, although it falls 6 min. behind the time which obtained to Blackpool in 1910. With it I made two runs, one behind 4-4-2 No. 1401 hauling 8 corridor 8-wheelers, and the other behind 4-cylinder 4-6-0 hauling 9 corridors, these trains representing gross weights of 235 and 265 tons respectively. On the first trip we passed Pendleton, 2·3 miles, in 5 min. 20 sec., and maintained 27½ m.p.h. up the 2 miles' ascent (mostly 1 in 94), to Pendlebury, passing Swinton, 5·1 miles, in 10½ min. No. 1513 started well, attaining 40 m.p.h. beyond Salford, but was brought almost to a dead stand by adverse signals at Windsor Bridge; so we took 6 min. 5 sec. to Pendleton and 12 min. 40 sec. to Swinton. There was an acceleration to 28½ m.p.h. on the 1 in 94, but we fell back to 26 on the 1 in 118, probably owing to premature notching up. On the dip to Walkden troughs the maxima were 54 m.p.h. on both runs, and before Atherton, 61 and 65 m.p.h. respectively, with intervening minima of 49 and 51 m.p.h.; so Atherton, 11 miles, was passed in 17 min. 50 sec. and 19 min. 40 sec., and the 8·4 miles from Swinton to Dobb's Brow Junction took 10 min. 10 sec. and 9 min. 50 sec.

There is a stiff ascent on the connecting line from this point to Horwich Fork Junction on the Bolton line, of which 1¼ miles are at 1 in 70, with a subsequent ¾-mile between Dicconson Lane and Hilton House at 1 in 200; on this our minimum on the first run was 31 m.p.h.— a good piece of work—but the climbing on the second was very poor, as we fell to 21½ m.p.h. So Hilton House, 16·2 miles, was passed in 24 min. 55 sec. and 27 min. 50 sec., and Horwich Fork Junction, 17·2 miles, in 26 min. 10 sec. and 29 min. 10 sec.; to Chorley, 22·7 miles, the times were 32 min. 50 sec. and 35½ min. On the downhill stretch from Chorley to Preston the running was very leisurely, complicated on the first run by signal checks, and nowhere exceeding 55½ and 58½ m.p.h.; so we took 37 min. 10 sec. and 39 min. 25 sec. to Euxton Junction, 25·6 miles, and 45 min. 20 sec. and 46 min. 35 sec. to Preston, 31·2 miles. Here we reduced to 20 m.p.h. on both runs. From Preston we took 10 and 11 min. to Kirkham, 7·9 miles (inclusive of a p.w.r. check in the second case), and 7 min. 50 sec. and 8 min. 25 sec. for the remaining 6·5 miles to Poulton—total 45·6 miles from Manchester (allowed 62 min.) in 63 min. 10 sec. and 66 min. respectively, or 61½ and 62 min. net. One might have looked for some brisker running west of Preston, as on these favourable grades we at no point exceeded 59 m.p.h. on either run.

On two trips to Southport we had ten "fireproof" vestibuled steel cars on the 5 p.m. train, weighing, with passengers, 295 tons; the engines were No. 1399, 4-4-2 and 1525, 4-6-0, respectively. The former passed Pendleton in 6 min., and falling to 24½ m.p.h. on Pendlebury bank, took 12 min. 5 sec. to Swinton; the latter, though three times checked by signals, did not fall below 27 m.p.h. on the bank, and took 6¼ min. to Pendleton and 12 min. 25 sec. to Swinton. At the troughs the speeds were 50 and 48½ m.p.h., and at Atherton 61 and 62½ m.p.h.; the latter station was passed in 19 min. 40 sec. and 20 min., Dobb's Brow Junction in 22 min. 40 sec. and 23 min. 5 sec., and Crow Nest Junction, 14·8 miles, in 23 min. 55 sec. and 24 min. 20 sec. On the first run adverse signals brought us to a dead stand in Wigan Station, 17·9 miles, in 28 min. 55 sec.; on the second we passed at 20 m.p.h. in 29 min. exactly. From the fresh start No. 1399 did fairly well with this load to pass Appley Bridge, 4·5 miles of steeply undulating grades, in 7 min. 55 sec.; the 5·3 miles thence to Burscough Bridge took 5 min. 40 sec., with a top speed of 64 m.p.h., and the final 6·6 miles to the stop at St. Luke's 7 min. 10 sec.— total 16·4 miles from Wigan in 20 min. 40 sec., and 50 min. 55 sec., or 47¾ min. net, for the 34·3 miles from Manchester. No. 1525's times were 6 min. 35 sec. from Wigan to Appley Bridge, 5¾ min. thence to Burscough Bridge, with a maximum of 62½ m.p.h., and as much as 7 min. 55 sec. on to St. Luke's, in virtue of an unnecessarily leisurely stop. This made a

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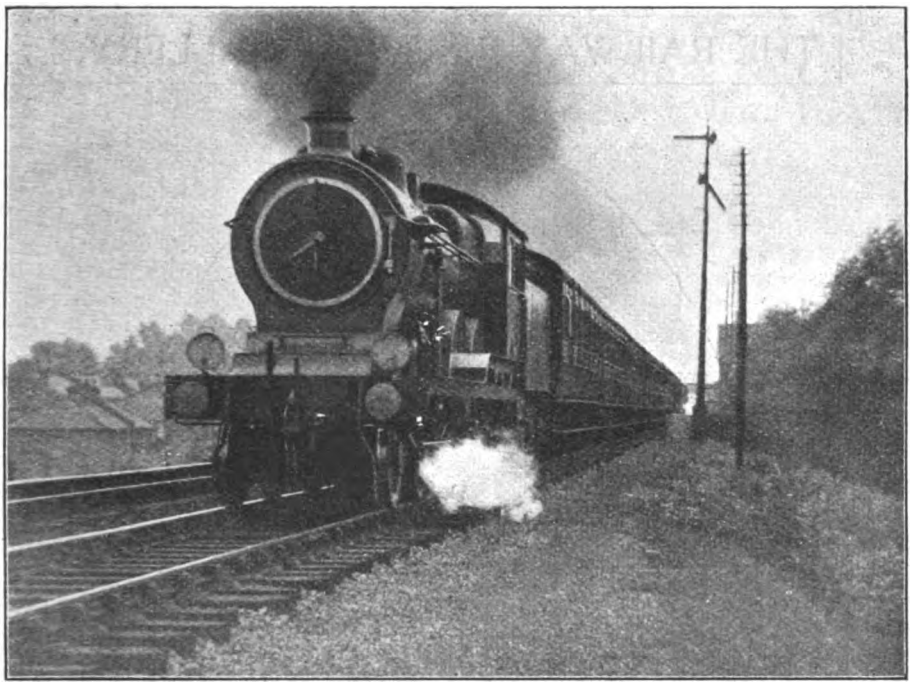
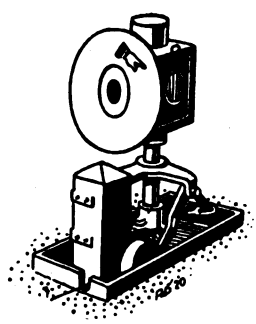


GREAT EASTERN RAILWAY.
London-Yarmouth Express, near Harold Wood. 4-6-0 Locomotive, No. 1517.

total of 20¼ min. from passing Wigan, and of 49¼ min., or 47¾ min. net, from Manchester. Present time allowance for this train is 47 min., and in 1910 it was 44 min., but the first 20 miles of the route, as also the similar initial stretch of the Blackpool route, furnish between them exceedingly hard going with such loads.

Just before closing, I would like to pass on the latest Bradshaw "joke," which may be found among the notes on page 281 of the January and a number of previous issues. Note "h," relating to conditional stops of certain expresses between Wakefield and Doncaster, is to this effect:—"Stops to take up London passengers only. Passengers must inform the Guard at the preceding *stopping* station."

The puzzle is—how *can* it be done?



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THE RAILWAY PORTRAIT GALLERY.

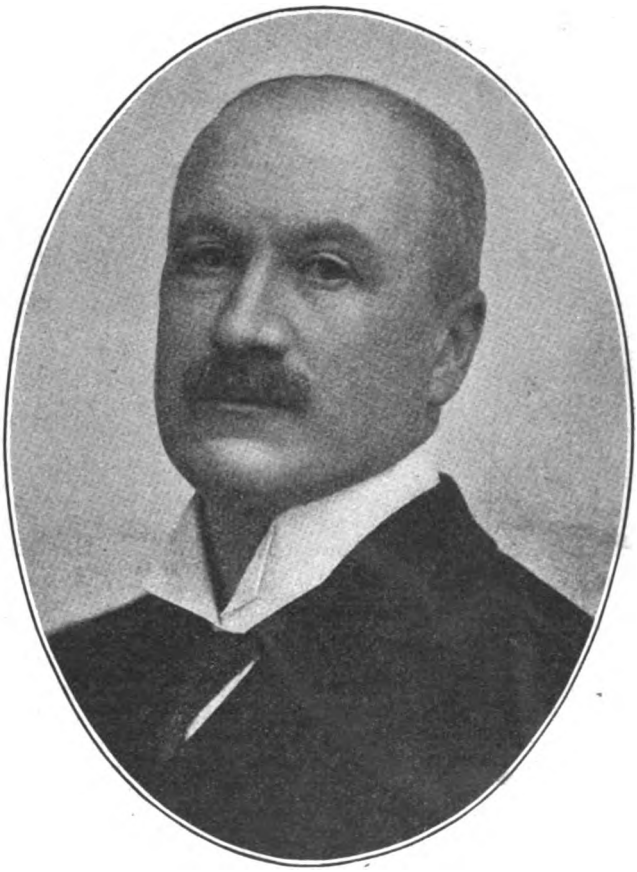

Photo.] **MR. WILLIAM WHITELAW,** [*Thompson.*

Chairman,

North British Railway.

IN Scottish railwaydom to-day the most outstanding figure is that of Mr. William Whitelaw, who in addition to being Chairman of the North British Railway, acts in a similar capacity for the Forth Bridge Railway, the Glasgow Subway Railway and the Glasgow Harbour Tunnel Company. He is also a Director of the Bank of Scotland. Born in 1868, the third son of the late Mr. Alexander Whitelaw, of Gartshore, Dumbartonshire, Mr. Whitelaw was educated at Harrow, and afterwards graduated at Cambridge University. He has had Parliamentary experience as the representative of Perth City in the House of Commons, 1892-1895. Mr. Whitelaw, it may be remembered, gave evidence before the Royal Commission on Railway Conciliation Boards. Appointed director of the Highland Railway in 1898, Mr. Whitelaw was Chairman of that Company 1901-1912. He was thereafter Deputy-Chairman 1912-1915 and was again Chairman, 1915-1916. He became a director of the North British Railway in 1908, Deputy-Chairman in 1910, and Chairman in 1912. He had therefore the distinction of being Chairman of both the North British and the Highland Railway Companies during 1915-1916. A born leader of men, skilful and diplomatic in all business affairs, the Scottish railway industry possesses in Mr. William Whitelaw, a spokesman of no mean order, and one to whom it may turn with confidence in times of stress or of difficulty.

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A Notable Change in General Managers.

LONDON & NORTH WESTERN AND LANCASHIRE & YORKSHIRE RAILWAYS.

WHILE there are precedents for the appointment of one general manager to control the working of two or more operatively independent lines, as in the case of the Cardiff, Rhymney and Taff Vale Railways, and in that of the North London Railway, which is managed by the chief officers of the London and North Western Railway, the appointment of Mr. Arthur Watson, C.B.E., as General Manager of the London & North Western Railway, in succession to Sir Thomas Williams, while retaining his present position as General Manager of the Lancashire and Yorkshire Railway, is a development of unique interest and importance. Ordinarily, it might be thought that either post would be a sufficient undertaking for any one person, so that this development must be considered to some extent an indication of the trend of affairs and an acknowledgment of the fact that, whatever scheme of grouping may eventually be adopted, there will certainly be a reduction in the number of managements. The London and North Western and the Lancashire and Yorkshire Railways have, however, always been closely associated for traffic purposes. These two companies have, indeed, had a pool of certain traffics since 1863, and, even in pre-war days, they were parties to working arrangements, so that, in that sense, this development is a logical one in view of the probable future of British railways. It will be remembered also that Mr. William Cawkwell, an earlier General Manager of the Lancashire and Yorkshire, went to the London and North Western as General Manager in succession to Captain Mark Huish.

That Mr. Watson should be selected as the first holder of a dual managership where both railways rank among the leading systems of the kingdom, may be regarded as a personal compliment. Still a comparatively young man, it is only the special abilities with which he has been invested that account for the remarkable progress he has made. As in the case of several of his *confrères*, his earlier appointments to positions of responsibility were on the engineering side, but in all positions he has "made good," not only in the carrying out of his duties as a chief officer responsible to the board of directors and the shareholders, but also in his personal relations with the staff of all grades.

In any event, however, the appointment of Mr. Arthur Watson to such a dual appointment applying to the two largest railway companies in the United Kingdom is of special interest. Born in Manchester in 1873, Mr. Watson was educated at the Manchester Grammar School and Victoria University, Manchester. In 1890 he was articled as a civil engineer to the Chief Engineer of the Lancashire and Yorkshire Railway, and during the years 1893-97 served as Assistant Resident Engineer on railway works. During the period 1897-1900 Mr. Watson was Divisional Engineer for Maintenance, and from 1900 to 1905 Resident Engineer on extensive railway construction works. He was appointed Chief Assistant Engineer to the company in 1905, holding that position until becoming Superintendent of the Line in 1911. During 1910 Mr. Watson attended the International Railway Congress at Berne, Switzerland, and in 1912 visited the United States and Canada on behalf of the company to inquire into railway practice. In 1914 he was elected a member of the Railway Executive Committee, on behalf of Sir John Aspinall, then interned in Germany, but on the latter's return was retained as a member. He is a Lieutenant-Colonel in the Railway Engineer and Staff Corps (Royal Engineers), a member of the Institution of Civil Engineers and of the Institute of Transport. In 1915 he was elected Chairman of the Superintendents' Conference of the Railway Clearing House, and re-elected for the years 1916 and 1918. In April, 1918, Mr. Watson was appointed Assistant General Manager, in combination with the position of Superintendent of the Line,

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and on the retirement of Sir John Aspinall in January, 1919, was selected to succeed him as General Manager. He is a member of the Railway Advisory Committee associated with the Ministry of Transport.

The retirement of Sir Thomas Williams, General Manager of the London and North Western Railway, after a long and active career in the company's service, has been followed by his election to the board. He started work in 1876, and for many years his associations were with South and Central Wales, until, in 1902, he went to Warrington as District Goods Manager. It was, however, when, in 1907, he was appointed to take charge of the principal goods depôt in London, at Broad Street,

Elliott] **MR. ARTHUR WATSON, C.B.E.,** [*& Fry.*

General Manager, London & North Western and Lancashire & Yorkshire Railways.

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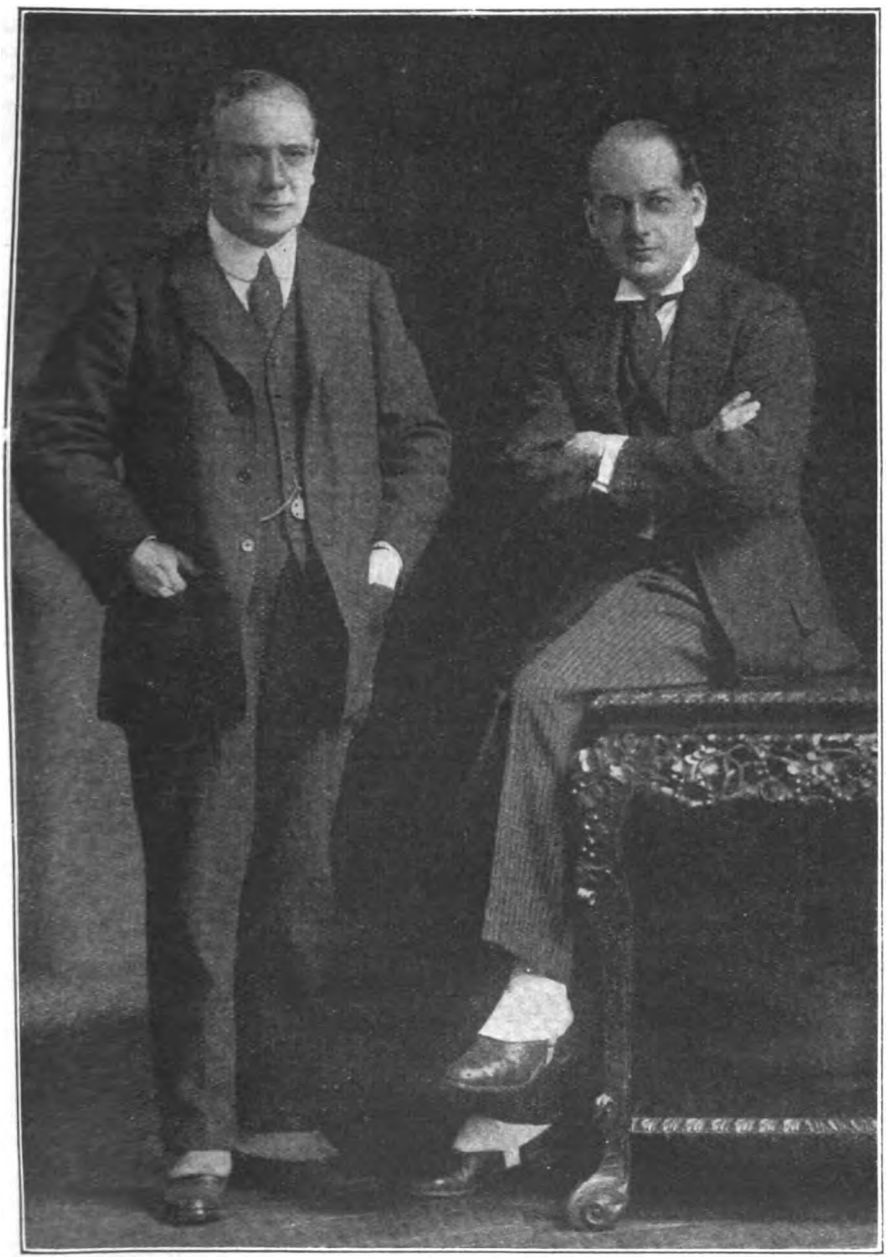

Photo.] [*Swaine, Bond Street.*

SIR THOMAS WILLIAMS, LATE GENERAL MANAGER, LONDON & NORTH WESTERN RAILWAY, AND HIS SON, MR. HOWARD WILLIAMS, C.B.E., GENERAL MANAGER, CENTRAL ARGENTINE RAILWAY.

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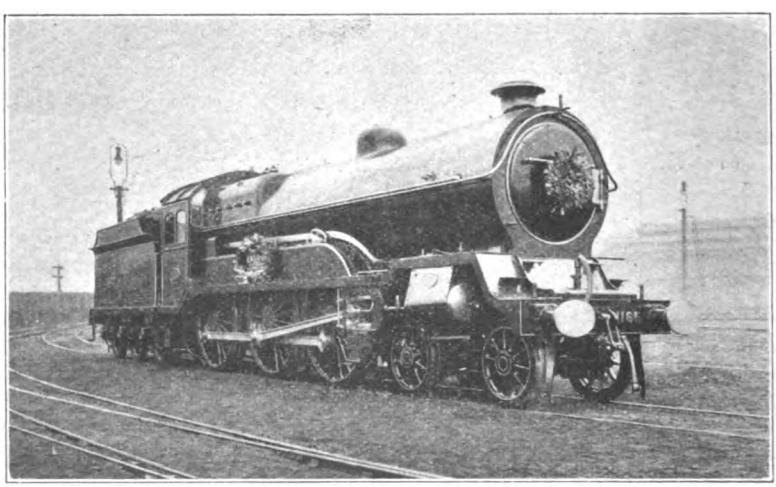
that Sir Thomas first came definitely to the front. Four years later he was appointed an Assistant to the General Manager, with headquarters at Euston, primarily to deal with labour questions and for work in connection with the Conciliation Boards. While holding that position he had many delicate problems to solve, and his associations with the staff side of railway service at that period have undoubtedly had much to do with his tactful dealing with matters which have arisen subsequently.

On January 1, 1914, he became Chief Goods Manager, and in February, 1917, when the late Sir Guy Calthrop was appointed Coal Controller, Sir Thomas Williams was appointed by the directors Acting General Manager. On the death of the former, Sir Thomas was, in March, 1919, appointed General Manager. In August, 1919, he received the honour of knighthood from his Majesty.

During the war Sir Thomas became a member of the Railway Executive, Canal Control and Port and Transit Committees, continuing as a member of the Railway Advisory Committee associated with the Ministry of Transport. During 1917 he was Chairman of the Goods Managers' Conference at the Railway Clearing House. Throughout his career he has maintained his associations with Welsh affairs.

We are also able to reproduce a photograph, showing Sir Thomas Williams, together with Mr. Howard Williams, C.B.E., appointed last year General Manager of the Central Argentine Railway, thus creating the unique situation of father and son being contemporaneously general managers of two leading railway companies.

GREAT CENTRAL RAILWAY MEMORIAL LOCOMOTIVE No. 1165 "VALOUR" ON ARMISTICE DAY, NOVEMBER 11th, 1920.



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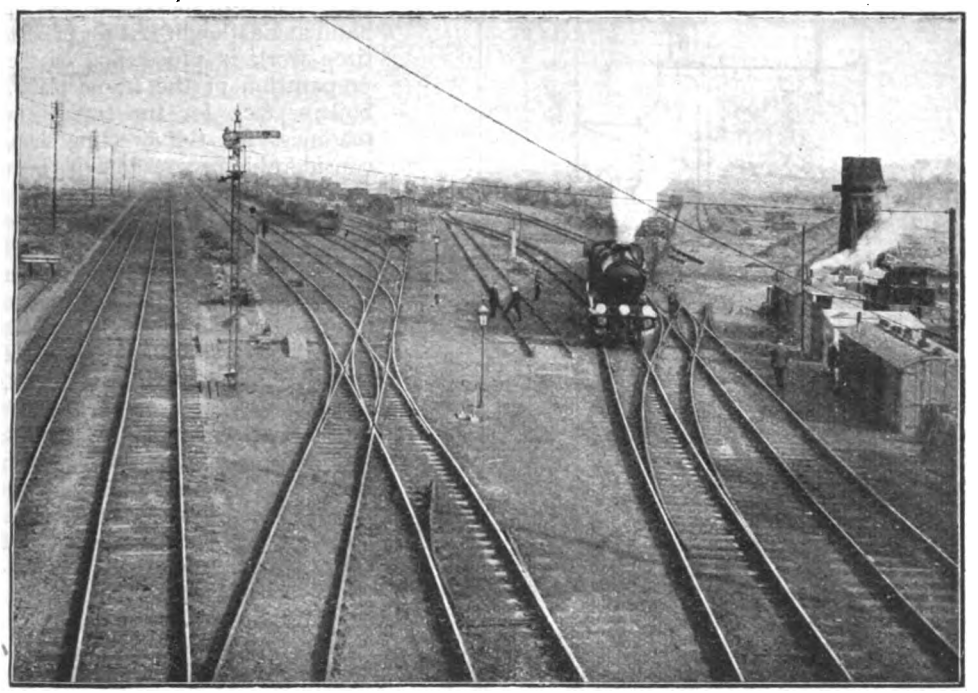

VIEW FROM NEW GIRDER BRIDGE AT WEST END OF YARD, LOOKING TOWARDS TWICKENHAM.
Main Lines on left, Loaded Train for Surbiton just pulling out.

Feltham Concentration Yard,

LONDON & SOUTH WESTERN RAILWAY.

IN the RAILWAY MAGAZINE for February, 1920, particulars and illustrations were given showing the new concentration yard under construction by the London and South Western Railway at Feltham.

On October 3 last, 16 new sidings, capable of holding 1,138 wagons, and known as the "Down Sorting Sidings," were brought into use, in addition to the nine roads already utilised—wagon capacity 696.

Simultaneously with the opening of the 16 new roads the practice of marshalling London and South Western goods trains at Willesden was discontinued, and the work carried out at Feltham instead. This also resulted in South Western shunters being withdrawn from Willesden, and now this company's guards carry out all movements made with London and South Western Railway engines at Willesden, under the supervision of staff provided by the London and North Western Railway.

The main features of the works have already been fully described in our previous article, and it is therefore unnecessary to repeat them here. Two views are, however, reproduced, one above, the other on page 80, by courtesy of the London and South Western Railway, showing scenes in the sidings. When the yard is entirely completed the "Down Sorting Sidings" now in use will be connected with the "Down Reception Sidings." These roads are at present cut short by stop blocks.

The work of constructing the "Down Reception Sidings" is in progress. Two shunting engines are continuously at work (Sundays excepted) dealing with 23 trains arriving and 19 departing, about 2,000 wagons coming and going daily.

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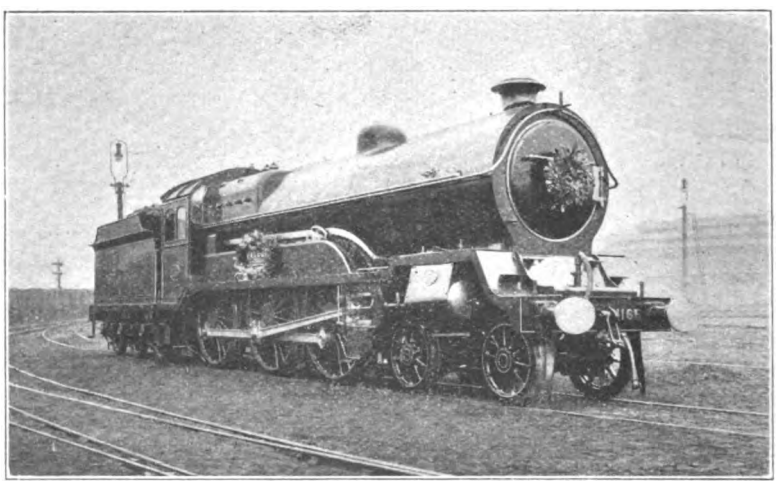

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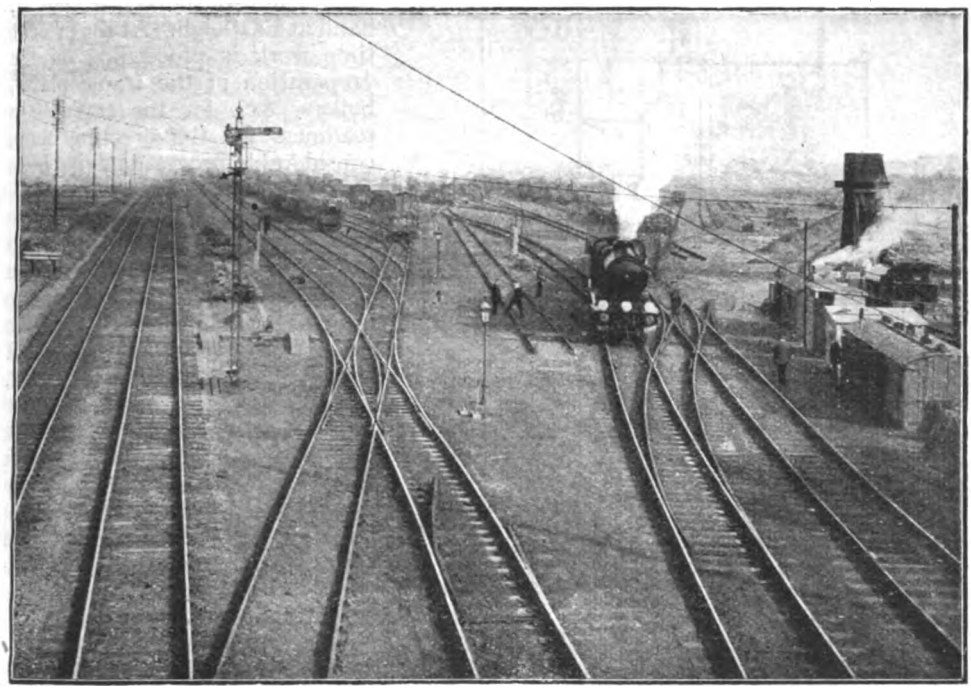

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On October 3 last, 16 new sidings, capable of holding 1,138 wagons, and known as the "Down Sorting Sidings," were brought into use, in addition to the nine roads already utilised—wagon capacity 696.

Simultaneously with the opening of the 16 new roads the practice of marshalling London and South Western goods trains at Willesden was discontinued, and the work carried out at Feltham instead. This also resulted in South Western shunters being withdrawn from Willesden, and now this company's guards carry out all movements made with London and South Western Railway engines at Willesden, under the supervision of staff provided by the London and North Western Railway.

The main features of the works have already been fully described in our previous article, and it is therefore unnecessary to repeat them here. Two views are, however, reproduced, one above, the other on page 80, by courtesy of the London and South Western Railway, showing scenes in the sidings. When the yard is entirely completed the "Down Sorting Sidings" now in use will be connected with the "Down Reception Sidings." These roads are at present cut short by stop blocks.

The work of constructing the "Down Reception Sidings" is in progress. Two shunting engines are continuously at work (Sundays excepted) dealing with 23 trains arriving and 19 departing, about 2,000 wagons coming and going daily.

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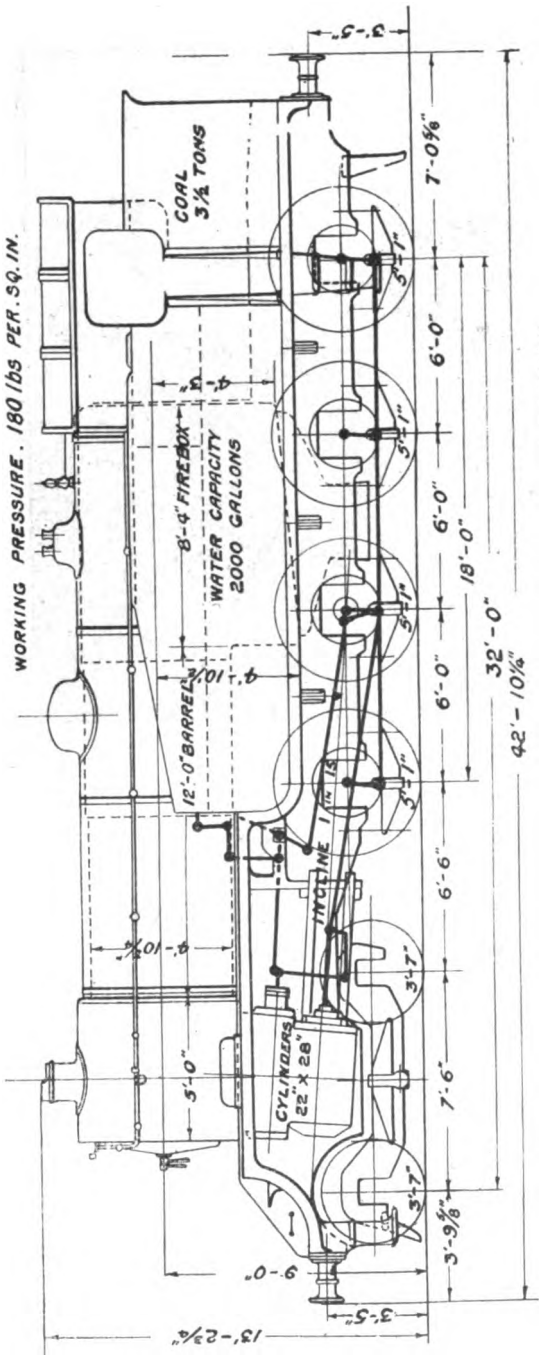

4-8-0 TANK ENGINE, LONDON & SOUTH WESTERN RAILWAY.
Designed by Mr. R. W. Urie, Chief Mechanical Engineer, for service at Feltham.

By the courtesy of Mr. R. W. Urie, Chief Mechanical Engineer, London and South Western Railway, we are also able to reproduce outline dimensioned drawings and give particulars of two new classes of tank locomotives designed expressly for Feltham traffic, the building of which will shortly be put in hand at Eastleigh. At the present time work is proceeding on the preparation of the frame plates, boilers, &c., for the engines, in readiness for the erecting shop, considerable progress having been made in this direction.

The engines are of two separate and distinct types, 4-6-2 and 4-8-0. The cylinders and motion of the 4-6-2 type tank engines are interchangeable with those of the 4-6-0 type goods locomotives of the latest class built at Eastleigh, whilst the same parts in the new 4-8-0 type tank engines are similarly interchangeable with those of the 4-6-0 type express locomotives. Further, the boilers for these new tank engines are of identical pattern, except as regards the shape and proportions of the ashpan, which latter is influenced by the wheel spacings, and thus interchangeable as between one class of engine and the other.

The cylinders with their piston valve steam chests are placed above them outside the frames, Walschaert valve motion being employed for actuating the valves. In the case of the 4-6-2 type engine, the cylinders are but very slightly inclined, but those of the 4-8-0 type engine, which are of larger size than the others, are inclined at 1 in 15. The cylinders drive the second pair of coupled wheels in both cases. The 4-6-2 type has a radial truck at the trailing end, the wheels of which are of the same diameter as those of the leading bogie, viz., 3 ft. 7 in. The coupled wheels measure 5 ft. 7 in. diam. on tread, arranged on a wheelbase of 15 ft., the total wheelbase being 36 ft. 6 in. The 4-8-0 type engine has 5 ft. 1 in. diam. coupled wheels with a wheelbase of 18 ft., and total wheelbase of 32 ft. The trailing coupled wheels have a side play each way of $\frac{11}{16}$ in. The four-wheeled bogies used with these engines are of the same design as those employed in the express goods locomotives referred to above. The wheels

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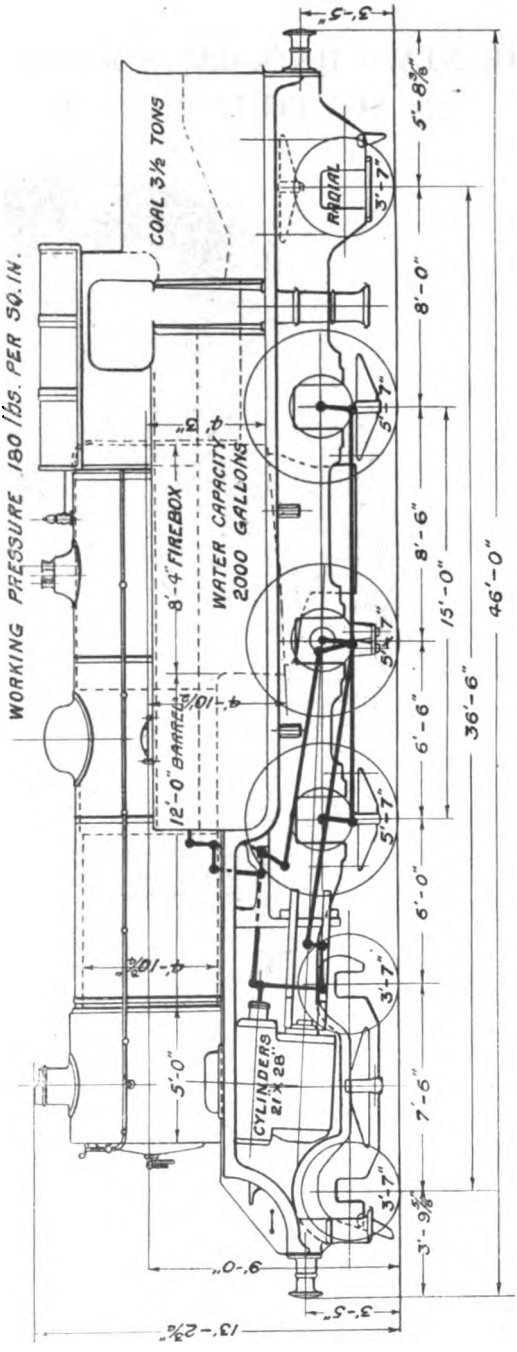
have a diameter of 3 ft. 7 in., and are set at 7 ft. 6 in. centres.

The boilers, which, as before remarked, are interchangeable as between the two classes of engines, are placed at 9 ft. centres above rail level. The boiler barrel is 12 ft. in length by 4 ft. 10¾ in. diam. outside at the front end. Superheating apparatus of the "Eastleigh" pattern is fitted, and a working pressure of 180 lb. per sq. in. is carried.

The smokebox has a length of 5 ft., whilst the firebox measures 8 ft. 4 in. long outside. The 4-6-2 type engine has 21 in. by 28 in. and the 4-8-0 type 22 in. by 28 in. cylinders. The estimated weight of both types is about 96 tons. The proportion available for adhesion is about 60 and 75 per cent. for the respective types.

The total water capacity of the tanks and the fuel space are the same in both cases, viz., 2,000 gallons of water and 3½ tons of coal. The tractive effort developed by the 4-6-2 type engine is 28,200 lb., and that of the 4-8-0 type 34,000 lb., calculated in both cases on the basis of 85 per cent. of the boiler pressure. The side tanks in the eight-coupled design slope downward at the forward end, to give the best possible view from the cab.

The 4-6-2 engines, of which five are to be built, are intended for working interchange traffic as between the Midland and London and North Western Railways and the South Western system in the London district. The 4-8-0 type, of which four are ordered, will be employed in the new concentration yard at Feltham for working trains on the up grades of the lumps, and for transfer service between Nine Elms and Feltham.



4-6-2 TANK ENGINE, LONDON & SOUTH WESTERN RAILWAY.
Designed by Mr. R. W. Urie, Chief Mechanical Engineer, for Feltham Traffic.

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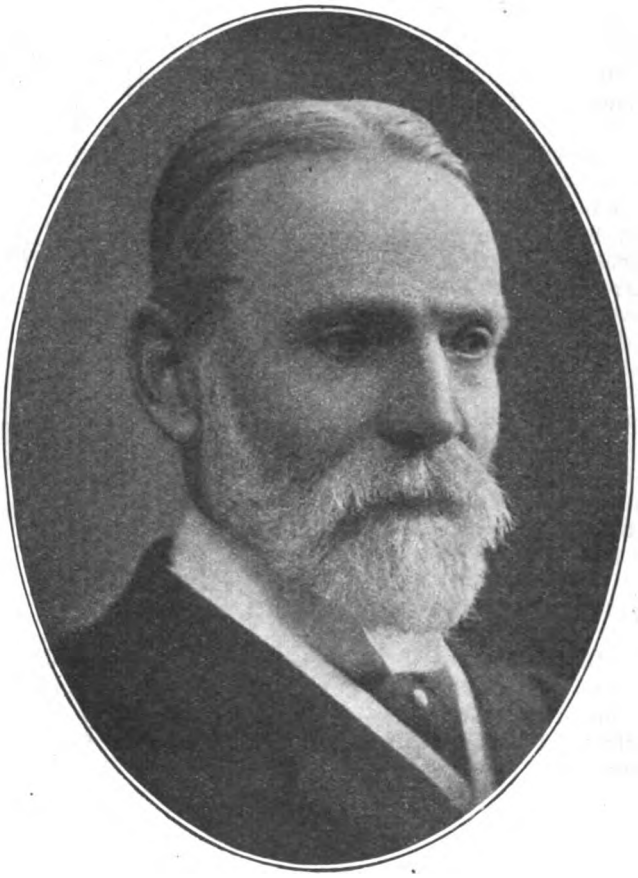
THE NEW CHAIRMAN OF THE LONDON, BRIGHTON & SOUTH COAST RAILWAY COMPANY.



London.] [*Stereoscopic Company.*

MR. CHARLES C. MACRAE, J.P.

MR. CHARLES COLIN MACRAE, J.P., who has been elected to the Chairmanship of the London, Brighton & South Coast Railway Company, following the death of Lord Bessborough, has had a distinguished legal as well as a commercial career. He was educated at Eton and at Oxford, and four years later was called to the Bar at Lincoln's Inn. He then went to Calcutta to practise, becoming known as an authority on Indian law, and acted for some time as Legislative Secretary to the Government of Bengal. Returning home in 1877, he acquired a large practice in commercial and shipping cases at the Common Law Bar, the Parliamentary Bar, and before the Privy Council in Indian appeals. He was also appointed standing counsel to the India Office.

Mr. Macrae's City career commenced in 1890, when he became Managing Director of the Railway Debenture and General Trust Company, Limited, and of the Railway Share Trust & Agency Company, Limited, of both of which he has for some years been Chairman. His direct connection with the London, Brighton & South Coast Railway Company began in 1893, when he was elected to a seat on the Board. Mr. Macrae was elected Deputy-Chairman in July, 1910. He is also Chairman of the Newhaven Harbour, White Pass & Yukon Railway and other companies, while he is a director of the Newburgh & North Fife Railway Company, and of several other important undertakings.

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New Electric Rolling-Stock, Metropolitan District and Metropolitan Railways.

IN the RAILWAY MAGAZINE for August, 1919, particulars and drawings were published of the new rolling-stock then on order for the Metropolitan District Railway. Many obstacles have impeded delivery, and it was not until December last that the first of the new cars could be placed in service.

At a press inspection and trial run from the Mansion House to Ealing Broadway, Mr. H. E. Blain, C.B.E., Operating Manager, and Mr. Z. E. Knapp, Manager for Maintenance and Construction, briefly remarked on the special features of the new vehicles, and explained the steps being taken to improve traffic conditions. The builders of the new cars are the Metropolitan Carriage, Wagon & Finance Company, of Birmingham, and the whole of the electrical equipment is being provided by the British Thomson-Houston Company, of Rugby. The new cars are 9 ft. 6 in. in width, 1 ft. wider than the old vehicles This additional width is obtained by extending the body to the limit of the step-board of the earlier type, the sides of the new cars being slightly curved instead of straight. In length there is little difference, the new cars being some 8 in. longer, that is to say, 49 ft. 8 in. overall. The roof is arched instead of clerestory. The exterior colouring is "engine lake," a deeper and more pleasing shade of red than the old-fashioned vermilion. Improved springing arrangements ensure easy riding, and the large bogies with which the trailer cars are fitted make for silence and smooth running. A useful innovation is the provision of two sets of train indicators, one on either side of the centre doors, showing "non-stopping" stations both in the East and West ends of London. The motor coaches are of higher power than their predecessors of the older stock, and the new trains will be capable of 45 m.p.h. on "non-stop" runs. Improved braking equipment has been adopted to secure more rapid deceleration. Internally as well as externally the new stock presents a pleasing appearance. The arched roof is painted white, to give good lighting reflection. The lower portions are finished in a teak-brown shade to harmonise with the general colour-scheme of upholstery, &c. Special attention has been paid to lighting. The lamps are fitted in artistic brackets, and the light is evenly diffused by opal reflectors. The interior metal fittings and door handles are of Florentine bronze and nickel plating.

The new cars, by reason of the added width, are more roomy than the old. There are no straps, but hand-rails and vertical pillars are conveniently placed at points near doorways and open spaces for the support of standing passengers. In the flooring the usual wooden slats are replaced by linoleum. At the end of each car large oval plateglass windows are provided. The arrangement of the doors in the new cars is, perhaps, the most important feature of all, from the point of view of the travelling public. Each trailer car has three double sliding doors on either side. Each of these three doors is wide enough to allow two passengers to enter or leave the car side by side at one time. The old type of "vestibule" at either end of the car is dispensed with, and in the new cars the doors are spaced at equal intervals along the side of the coach, so that, in whatever part of the car a passenger may be seated, he will always have a door conveniently accessible. On the motor cars and control trailer cars, in addition to the three double doors, single doors at fitted at the ends of the cars, and these doors will also be available for the use of passengers when not required by the operating staff.

An eight-car train of the new stock will give the equivalent of 52 single doors throughout its length, and the provision of these facilities will further reduce the time at stations. By thus accelerating the working of individual trains it will be possible to increase their number

As soon as sufficient of the new vehicles are available, a standard make-up of eight

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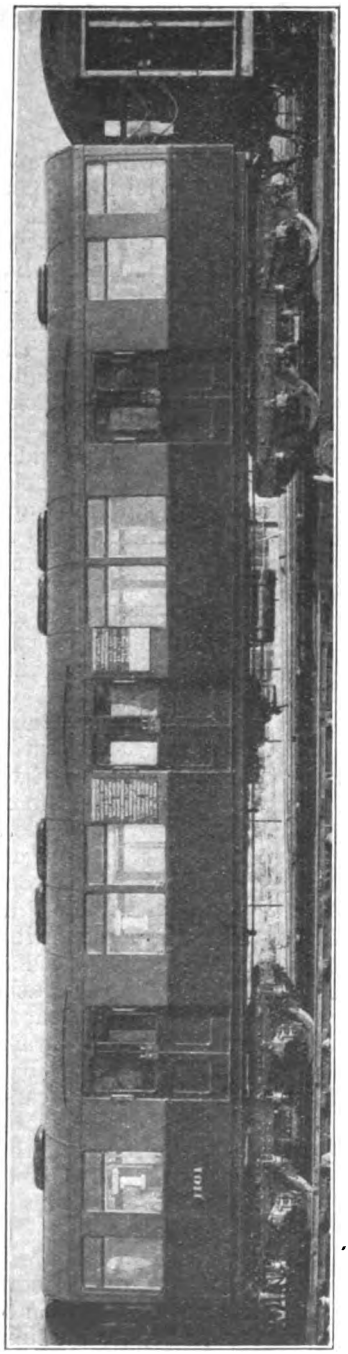
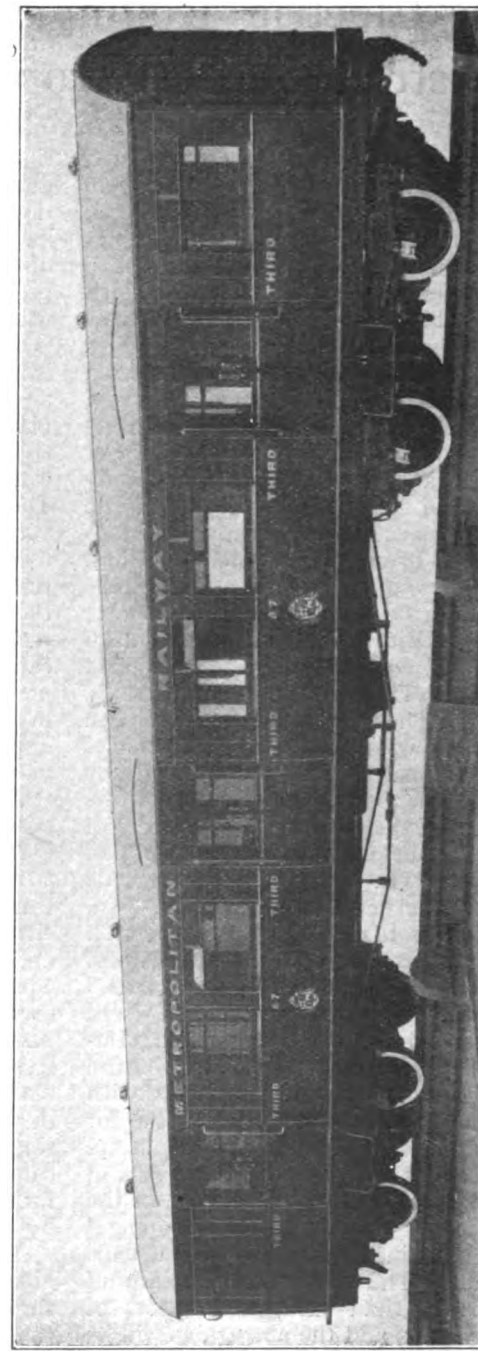


NEW ROLLING-STOCK, METROPOLITAN DISTRICT RAILWAY, WITH THREE DOUBLE SLIDING DOORS.



NEW ROLLING-STOCK, METROPOLITAN RAILWAY, WITH THREE DOUBLE SLIDING DOORS.

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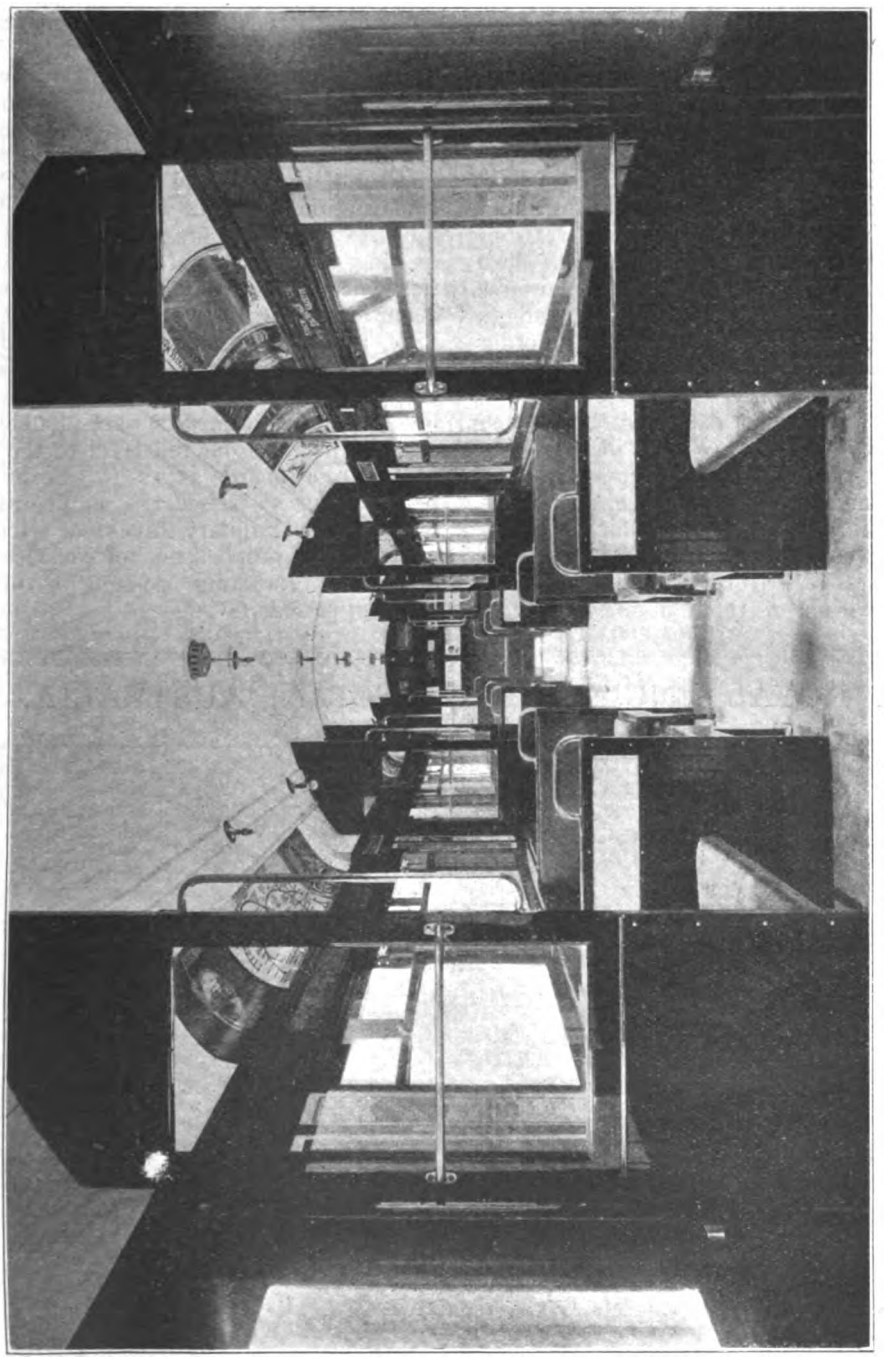

INTERIOR OF NEW TRAILER CAR, METROPOLITAN RAILWAY.

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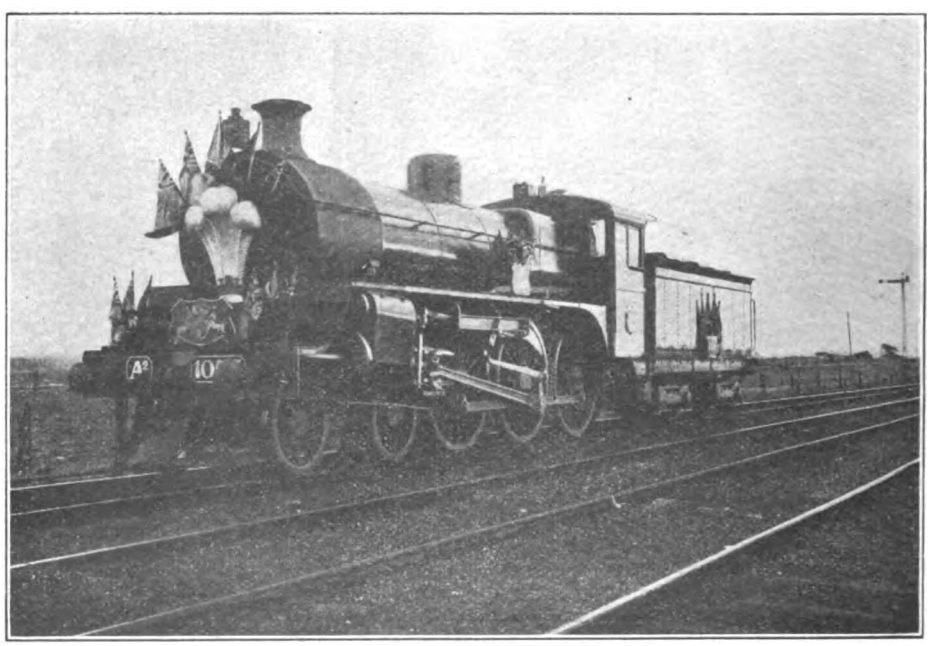
cars will be made of two self-contained components, of five and three cars respectively. It will thus be possible to operate one portion of the eight-car train as a five-car train during the slack hours, while the three-car portion can be utilised for service at the same time on certain local sections of the line where traffic is light.

Last month particulars were given of the new vehicles which are being placed in service on the Metropolitan Railway, designed with a view to facilitating rapid entraining and detraining at stations during periods of congested traffic. Two interesting views of these vehicles are now reproduced. Twenty motor cars and 39 trailer cars of the new design are on order with the Metropolitan Railway Carriage, Wagon & Finance Company, Limited, but, so far, trailer cars only have been delivered. These have been inserted into the four-car Inner Circle sets, thus providing much-needed increase of accommodation for these trains, which are now made up to a standard of five vehicles.

The special feature of these vehicles is the provision of three double doors of sliding type on each side, and the elimination of connecting vestibules. By placing the doors midway and towards, but not directly at, the ends, all three pairs are available for passenger movement inside the car both to right and left. The doorways are of liberal dimensions, each measuring 4 ft., so as to provide ample room for two people to enter or leave together. Steadying rails are provided instead of straps, steel is largely used in construction, while all woodwork is specially treated against fire; and the lighting, heating, ventilation, upholstery and advertisement display have received careful attention. These cars are 50 ft. 10 in. long over underframes; the bogies, which have wheels 3ft. diameter on a wheelbase of 7 ft. are placed at 35-ft. centres; the bodies are 8 ft. 9 in. wide over mouldings, and the height from rail level to the top of the roof boards is 12 ft. Seats are provided for 50 passengers as compared with 48 in the ordinary three-door vehicles, while there is ample space for considerable numbers of standing passengers during the rush periods.

A ROYAL ENGINE IN VICTORIA, AUSTRALIA.



4-6-0 LOCOMOTIVE, VICTORIAN GOVERNMENT RAILWAYS.
Decorated for working the train conveying H.R.H. The Prince of Wales.

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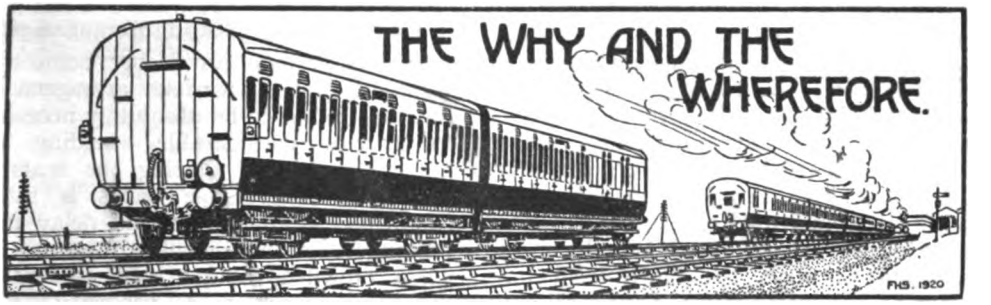

Railway Magazine *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* Railway Magazine, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," the twenty-third Annual Edition, published in April,* 1920, *is out of print, but a new one is in preparation, in readiness for publication in April,* 1921.

The Severn Barrage.

Obviously the fact that the Great Western Railway would benefit by the realisation of this scheme is incidental, and whether it is carried out or not presumably it will eventually be necessary to increase rail communications across the Severn estuary. But in so far as the proposal provides a solution of the traffic necessities of the situation, it is to be presumed that the Great Western Railway Company would be required to contribute to the cost, or they would pay toll for the use of the railway route thus supplied. The road and railway bridge is, however, only part of the greater scheme. In one way or another, it would, of course, be necessary to impose certain tolls and charges for the use of the bridge, both by rail and road, unless the former is covered by Great Western Railway contributions to the cost, which would probably be balanced by a mileage or other allowance, as in the case of the Severn tunnel, and the latter made a national charge or met by contributions from the Roads section of the Ministry of Transport. Although a special mileage charge is allowed on account of the Severn tunnel, we may point out that its construction materially shortened certain railway routes and therefore reduced the mileage for charging purposes, thus practically balancing the special allowance.

[Reply to "West Riding."]

York Service, Great Eastern Railway.

Only one express actually runs through now between Liverpool Street and York, and that is the south-bound train leaving York at 4.32 p.m., and due in London at 10.34 p.m. The train reaching York at 4.33 p.m., and that leaving York at 10.25 a.m., is, in each case, a through corridor restaurant car express between York and Harwich, *via* March, Ely, Bury, and Ipswich, while the train reaching York at 10.25 p.m. comes from Yarmouth at 3.5 p.m., *via* Dereham, Lynn, Wisbech, and March. The York service is intended for passengers from the Eastern Counties rather than from London; but London passengers can use the trains in question by taking connecting trains from Liverpool Street to March, 86 miles, and joining the York trains there (except in the case of the one through up train). To March the route is entirely Great Eastern; thence to Black Carr Junction, Doncaster, is Great Northern and Great Eastern Joint; from Black Carr through Doncaster to Shaftholme Junction, 4 miles, is Great Northern, and the remaining 30 miles are North Eastern Railway territory.

[Reply to "Roybermar."]

East Croydon, London Brighton and South Coast Railway.

The old station included a down island, with a loop outside to the east serving what was one of the original platforms,

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but since utilised only for horse and carriage loading and like purposes. It was, however, a through line, though not used for through traffic. Adjacent were the early station buildings, giving access *via* a subway to other platforms. There was also a through up main platform with a terminal road on the west side for part of its length, the remainder being widened to serve the down local line. Next to the latter was the up local line, its platform, together with a terminal line on its west side, constituting New Croydon Station, served by a separate booking office. There were also station buildings on the middle or up main platform. The arrangement outlined above was certainly in use in 1868, but we cannot say definitely when the old platform mentioned ceased to be used for ordinary traffic.

[Reply to J. M. ADAMS.]

London and North Western Railway Locomotive Sheds.

Most have several sub-sheds in the same district, but we cannot afford space for full particulars. No. 7 is Netherfield and Colwick (covering sub-sheds at Doncaster and Sheffield); No. 12 is Burton, with a sub-shed at Derby; No. 32 is Workington, with a sub-shed at Penrith; and No. 33 is Swansea, with sub-sheds at Builth Road, Carmarthen and Llandovery. You are right in regard to Nos. 3, 9, 13, 14, 18, 21, 22 and 23. No. 24 is Peasley Cross; No. 31 is Abergavenny, of which Hereford is a sub-shed. See Mr. C. Williams' publications for further details.

[Reply to A. W. VAN DER MEULEN.]

Locomotive Classes.

We cannot spare the space to give all the locomotive classes on the Great Northern and Great Eastern Railways, as these are very numerous. For the former see G. F. Bird's "Locomotives of the Great Northern Railway," and for the latter the census which appeared in the *Great Eastern Railway Magazine*, November 1916, and January, March, May, July, September, November, and December, 1917. The 1270 series of superheated 0-6-0 engines, Great Eastern Railway, are classed as D 81.

[Reply to ALEX. HAIN, "BOCLERK," and D. H. STUART.]

"Underground" Seating Arrangements.

Several systems are in use, some as a result of trials of various arrangements, but it is found to be absolutely necessary to provide considerable standing and movement space. Placing the seats in pairs, with reversible backs, is rather conducive to congestion and delay from passengers having difficulty in getting out when crowded, and a fair amount of standing space is a necessity. Very similar types are used for the New York subway and similar services, for the same reasons.

[Reply to H. L. READ.]

Express Locomotives, London and South Western Railway.

According to the latest official figures (see RAILWAY YEAR BOOK) there are 302 large and small-wheeled 4-4-0, 46 4-6-0, 6 4-2-2-0, and 90 0-4-2 engines on this railway. It would be impossible to designate any of these as exclusively "express" locomotives, as the London and South Western Railway employ both 4-4-0 and 4-6-0 engines to a considerable extent on goods service. The last-mentioned are now employed mainly on subsidiary services.

[Reply to F.J.D.]

Gradients, Faversham to Dover, South Eastern and Chatham Railway.

From Faversham, Selling bank rises at 1 in 264 for ¾-mile and 1 in 110–100 for 3¼ miles to mile-post 56¼; thence for 5 miles to ½-mile short of Canterbury is almost entirely falling at 1 in 132. From mile-post 62¼ there ensue 8¾ miles of broken, but mainly rising grades, including 4¾ up at 1 in 105–132, to mile-post 71; from there to Dover Harbour is a practically unbroken fall, beginning with 5 miles at 1 in 132, and finishing with 1½ at 1 in 106.

[Reply to T. M. LEWIS.]

Wycombe and Aylesbury Routes, Great Central Railway.

Neasden Junction is the point of divergence, and Grendon Underwood Junction, 2 miles south of Calvert, the point of convergence of these two routes. Great Western metals are not used by trains traversing the Wycombe route, as the Northolt-Ashendon Junction section, used by both companies, is Great Western and

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Great Central Joint, the connecting portions between Neasden and Northolt, and Ashendon and Grendon, respectively, being Great Central property.

[Reply to "ATLANTIC."]

Cab-Signalling, Great Western Railway.

Mr. T. S. Lascelles points out that the reply in the January RAILWAY MAGAZINE does not quite meet the case, in that batteries are carried on the engines for maintaining continuous currents, except when the shoe is lifted by a ramp. Operation depends, however, primarily upon whether the ramp is electrified or not, and this is mainly what we had in mind when replying, necessarily in very brief terms.

[Further reply to E. WYETT.]

"Assorted" Engines and Tenders.

Owing to arrears of maintenance it is frequently necessary in these days, as a temporary measure, to "mate" an engine with a tender belonging to another engine, while the latter and the tender of the former are laid up for repairs. This was doubtless the case with 4-4-0 No. 1806 on the Great Eastern Railway, which you saw attached to the tender of 4-6-0 No. 1537. Such irregular unions, we may add, are not as binding as matrimony!

[Reply to "ROYBERMAR."]

Waterloo and City Railway.

Obviously there can be no direct rail connection between this line and the main London and South Western Railway system above, owing to the great difference in level. There is, however, a lift for transferring cars when necessary. It has been proposed to extend the Waterloo and City to join the London and South Western Railway proper, but that would necessitate a new railway to about Vauxhall.

[Reply to J. MALLET.]

Most Powerful Express Engines in 1899 and 1908.

So far as nominal tractive power is concerned, the palm for power in 1899 lay probably with the first of the North Eastern Railway "S" class 4-6-0's, closely followed by the early Lancashire and Yorkshire and Great Northern "Atlantics." In 1908 the London and South Western "330" class 4-cylinder 4-6-0's would doubtless take the first place, followed by the early Great Western 4-cylinder 4-6-0's.

[Reply to L. &. Y.]

Railway Carriage Roofs.

Clerestory roofs date back to quite early days for special vehicles, and they were used in the United States for Pullman and similar types of cars fifty years and more ago. Apparently the Pullman cars imported by various British railways were the first in this country including this feature. Elliptical roofs are now general as they give greater roof space inside the compartment and are cheaper and simpler to construct.

[Reply to "DERBY-RED."]

4-4-0 Compound Engines, Midland Railway.

No. 2632 was one of the original five compound engines built by Mr. S. W. Johnson, which were equipped with bogie tenders at the time of their construction. These were rebuilt at a later date by Mr. R. M. Deeley to conform in all respects to his later compound series (1005-1044, inclusive), being equipped at the same time with six-wheeled tenders and renumbered 1000-1004.

[Reply to "BOGIE."]

Disused Tunnels, City and South London Railway.

The original tunnels from King William Street Station are still in existence, but the permanent way has been removed, and the ends, where they join the present lines, boarded up. They are not used for any specific purpose, except perhaps for storing p.w. material. Premises at street level are used as shops.

[Reply to C. THOMPSON and G. N. SOUTHERDEN.]

4-cylinder 4-6-0 Engines, Great Central Railway.

Engines of the *Lord Faringdon* type are intended for general express service on the Great Central Railway main line, but principally, we believe, for working express trains between Leicester and Manchester, where the heavier grades are encountered. They are the most powerful express engines on the Great Central Railway.

[Reply to "ATLANTIC."]

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4-4-2 "Precursor" Tanks, London and North Western Railway.

None of these engines have been superheated. They work the bulk of the suburban and outer suburban trains in the London area, and are also largely used in the neighbourhood of Manchester. Sheds are so frequently changed that it would be useless to specify them, even if space were available therefor.

[Reply to D. J. BELL and "MANCUNIAN."]

London and North Western Railway Locomotives.

No. 739, *Ostrich*, is a 6-ft. 2-4-0 engine of the "Samson" type, and was built in 1864; No. 1994, *Scottish Chief*, is a 4-6-0 "Experiment," dated 1906; and No. 2193, *Salopian*, is a 2-4-0 "Precedent" (6 ft. 6 in.), of 1875. Consult Mr. C. Williams' "Locomotives of the London and North Western Railway," for further information of this character.

[Reply to W. E. BOYD.]

Fishponds Bank, Midland Railway.

From Temple Meads Station, Bristol, after about a mile of short undulations, the line rises from Lawrence Hill Junction for two miles to Fishponds, at gradients mainly at 1 in 69, or only a little easier. The actual top of the bank is at Staple Hill tunnel, about three-quarters of a mile beyond Fishponds station, but the concluding section is much easier.

[Reply to A.R.C.]

Marshalling Yards.

The following are the principal yards in the United Kingdom, utilising gravity or "hump" sorting methods:—*London and North Western Railway*: Edge Hill, Wembley, Nuneaton; *Midland Railway*: Toton, Chaddesdon; *North Eastern Railway*: Eremus; *Great Central Railway*: Wath; *London and South Western Railway*: Feltham.

[Reply to E. J. M.]

Vestibuled Corridor Trains, South Eastern and Chatham Railway.

Except for certain vehicles used in pre-war days for the through Deal-Birkenhead and like services, vestibuled corridor coaches are not used, and we are not aware of any trains on the South Eastern and Chatham Railway which are thus made up. Pullman cars are, of course, vestibuled, but these are not corridor vehicles such as you specify.

[Reply to J. C. DREW.]

Track Circuit Indicators.

We are advised by Mr. J. Calder, General Manager, North British Railway, that the diamond-shaped discs, showing dark blue lights at night, fitted to signal posts on the North British Railway, about 10 ft. above rail level, indicate that track circuit is installed, or other apparatus provided, so that Rule 55 need not be carried out.

[Reply to "WAVERLEY."]

Midland Goods Wagons.

It is necessary to ascertain the type of wagon to arrive at its load, in the case of coal and like traffic, 8, 10 and 12 ton and other capacities being in use. Tare may be taken at 5 to 6 tons. For general goods about 5½ tons for the load is a reasonable estimate. Allowances must, of course, be made for empties.

[Reply to A.R.C.]

Windsor Line, London and South Western Railway.

Ordinary "block" trains are probably used on this route owing to the displacement of this stock on other outer suburban sections by the electric trains. It is unlikely that any further electrification will be undertaken for some time to come, though the complete scheme anticipated has not yet been carried out.

[Reply to R. GOLDING.]

Great Western Railway Water Troughs.

These are situated near Goring, Keynsham, Creech, Aldermaston, Westbury, Exminster, Chipping Sodbury, Severn Tunnel Junction, Ferryside, Ludlow and Denham, King's Sutton, Lapworth, and Charlbury, 14 sets in all. For information of this character, consult the RAILWAY YEAR BOOK.

[Reply to A. A. COX.]

Named Engines on the London and North Western Railway.

No. 2059, one of a new batch of 4-6-0 "Claughton" express engines, is to be named *C. J. Bowen Cooke*, after the late Chief Mechanical Engineer. There is no reason to suppose that the Midland Company will depart from their present

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practice of not naming their express engines.

[Reply to "VIVIAN."]

Salcey Forest.

Further enquiries have been made, and we are now informed that in 1891 a station of this name was opened on the Stratford-upon-Avon and Midland Junction Railway. It was, however, served by passenger traffic for a few months only, though it is still used for goods and mineral traffic.

[Reply to C. R. CLINKER.]

Midland Railway Gradients.

For so short a distance we can hardly specify the gradients in detail, especially as they change so frequently, but there is a short section at 1 in 88, about 300 yards are level, and the prevailing grade is about 1 in 182, between St. Pancras and Camden Road.

[Reply to "DERBY-RED."]

Coal Tax Obelisks.

These are to be observed alongside most of the older railways out of London, at a distance of about 10 miles from the London boundaries. They correspond with the points on adjacent public roads where certain taxes upon coal entering the metropolis became operative in years gone by.

[Reply to "Z."]

Charing Cross Station.

There is no physical connection between any of the various lines using this station. Through working from one tube to another would be convenient in some respects, but connecting lines would be expensive to construct, and junction working is not convenient where trains are so frequent.

[Reply to J. MALLET.]

Old Oak Common Sheds, Great Western Railway.

These rank amongst the most modern and up-to-date sheds in the metropolitan area, but we cannot say whether they are the largest. Some of the older sheds have to serve more engines, though the accommodation may be less modern and convenient.

[Reply to A. A. COX.]

Westinghouse-Fitted Engines, Midland Railway.

There are one or two engines of this company, other than those taken over from the Tilbury line, fitted with the Westinghouse brake for "foreign" working purposes, but we are not in possession of the numbers.

[Reply to "SINGLE-WHEELER."]

Midland and Great Northern Joint Railway Locomotives.

Tender types: 55 (4-4-0); 20 (0-6-0). Tank types: 3 (4-4-2); 11 (0-6-0); 2 (4-4-0). Several of the tender engines of both types have been rebuilt with larger boilers.

[Reply to "DERBY-RED."]

2-10-2 Locomotives.

As far as we are aware none of these locomotives on the Atchison, Topeka and Santa Fe Railway are now tandem compounds, nor can we recall any tandem compounds on other lines now existing in that form.

[Reply to "BOGIE:"]

Trans-Siberian Railway.

Obviously this was never intended for high speed travel, as we understand it in this country, but an average of 12 m.p.h. from end to end, including time spent at stations, would be very creditable.

[Reply to "BOGIE."]

4-4-2 Locomotives, Great Western Railway.

Except for the three French compound locomotives, all Great Western Railway "Atlantics" have long since been converted to 4-6-0. Please see rules as to lists of numbers and names.

[Reply to "MANCUNIAN."]

R.O.D. 2-8-0 Engines.

The London and South Western Railway is in course of disposing of the 10 engines of this type employed for a short period, but we have no exact information at the moment.

[Reply to F.J.D.]

Cross-Bar Signals.

Presumably you refer to one of the various forms of shunting signals employed for subsidiary purposes to render them distinctive from the standard running signals.

[Reply to D. J. BELL.]

Shed Numbers, London and North Western Railway.

No. 36 is blank. Bushbury shed is 1½ miles north of Wolverhampton and Springs

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Branch serves a colliery line diverging to the east at a point just south of Wigan, on the Carlisle main line.

[Reply to "SINGLE-WHEELER."]

Electric Rolling-Stock, London and North Western Railway.

Electric motor-cars have four 250 h.p. motors. They are adapted for standard running speeds of about 35 m.p.h.

[Reply to E. T. KIRBY.]

Lazonby Accident, Midland Railway, 1918.

The 4-4-0 compound No. 1010 was the engine involved in this derailment (caused by a landslip). The locomotive in question has since been repaired and is at work.

[Reply to W. P. PLUNKETT.]

Caledonian Railway, 4-6-0 No. 188.

One of a series of 10 engines designed by Mr. J. F. M'Intosh, all of which have the large cab with side-windows, and are the only Caledonian engines so equipped.

[Reply to HENRY FORDE.]

Future Locomotive Building.

We have received no information from the companies mentioned by you as to their present and future building programmes.

[Reply to A. PRINCE and O.O.P.]

2-2-4 Tank Engines, North Eastern Railway.

The most famous of these engines, No. 66, *Aerolite*, was fully described in the RAILWAY MAGAZINE for November, 1918.

[Reply to W. I. PEARKS.]

Woodside and Selsdon Branch.

This branch will remain closed for the present. It is not possible to furnish information as regards re-opening.

[Reply to "BUFFERS."]

London and North Western Railway "Experiments."

No engines of this type have been superheated other than *Prospero*.

[Reply to "CLAUGHTONIAN."]

"Prince of Wales" Class 4-6-0's, London and North Western Railway.

Messrs. Beardmore have not yet delivered any of these engines.

[Reply to A. PRINCE.]

Furness Railway 4-4-2 Tanks.

These are used principally on the Windermere branch.

[Reply to W. R. P. L.]

PARLIAMENT AND THE SETTLE AND CARLISLE LINE.

IN these days when it is customary to condemn parliamentary or governmental interference in commercial affairs or railway matters, a case wherein parliamentary wisdom proved superior to that of a great railway company may be worthy of recall.

Mr. Joseph Tatlow in his interesting biography entitled *"Fifty Years of Railway Life in England, Scotland and Ireland," dealing with the greatest achievement of the Midland Railway, the Settle and Carlisle line, opened in 1875, writes:—"In 1866, they obtained the Act for its construction. For some years their eyes had been eagerly turned towards Scotland as the eyes of Scotsmen had ever been towards England, and for the same reason—the hope of gain. The Midland had hitherto been excluded from any proper share of the Scotch traffic, but now having secured the right to extend their system to Carlisle, they hoped to join forces with their allies, the Glasgow & South Western, and secure a fair share of it. But 'there's many a slip 'twixt the cup and the lip,' and in 1869 in a fit of timidity—a weakness most unusual with them—they nearly lost this valuable right. The year 1867 was a time of great financial anxiety; the Midland was weighted with heavy expenditure on their London extension, the necessity for further capital became clamant, the shareholders were seized with alarm, and a shareholder's consultation committee was appointed, with the result that in 1869, the company, badgered and worried beyond endurance, actually applied to Parliament for power to abandon the Settle and Carlisle line, and for authority to enter into an agreement with the London & North Western for access over that company's railway to Carlisle. That power and authority however, Parliament, in its wisdom, refused to give. The financial clouds, as all clouds do, after a time dispersed. The outlook grew brighter, the Midland made the line, and it was opened."

* In stock at THE RAILWAY MAGAZINE offices, price 10s. By post, 10s. 9d.

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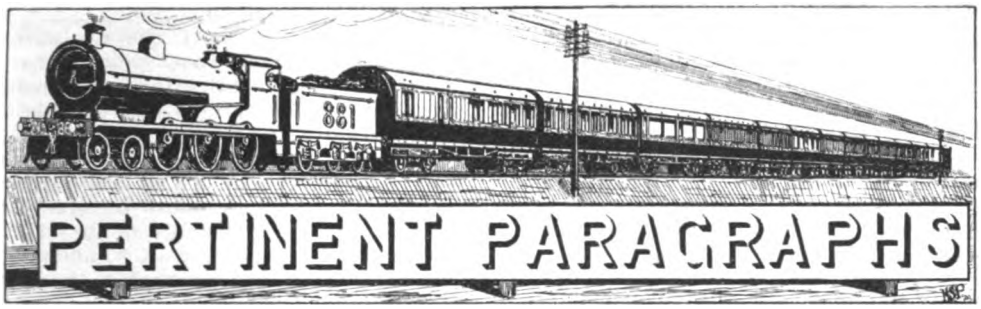

Our Frontispiece.

A VIEW is reproduced, showing the latest class of 0-6-0 superheater mineral locomotive designed by Mr. A. J. Hill, C.B.E., Chief Mechanical Engineer, Great Eastern Railway. This design is developed from the corresponding class which has been in use for a number of years past; but is notable in that the same boiler and cylinders are used as for the 4-6-0 express passenger locomotives, while the wheelbase is of unusual length, 18 ft. 10 in.

The boiler has a Belpaire firebox, and the barrel is 12 ft. 6 in. in length, and 5 ft. internal diam. at the front ring. It contains 191 ordinary tubes of 1¾ in. external diam., and 21 tubes, containing superheater elements, of 5¼ in. external diam. Heating surface of the ordinary tubes is 1,123 sq. ft., larger tubes 366·1 sq. ft., firebox 143·5 sq. ft., and superheating surface 201·6 sq. ft., total 1,834·2 sq. ft. Grate area is 26·5 sq. ft., and steam pressure 180 lb. per sq. in. Cylinders are 20 in. by 28 in., and the coupled wheels 4 ft. 11 in. diam., spaced 8 ft. 10 in. and 10 ft. Tractive force at 85 per cent. is 29,044 lb. Weight of engine in working order, 54 tons 15 cwts. Tender capacity is—coal, 5 tons; water, 3,500 galls. Weight in working order, 38 tons 5 cwts. These engines, which are principally employed in heavy coal traffic, are known as class D 81.

Grouping of Railways.

IN our last issue we referred to the statement issued by the Railway Companies' Association, embodying what is known as the four-group scheme, in conjunction with comments, criticisms and alternatives to the Government proposals. Other reports have also been issued by trading associations, including the Transportation Committee of the London Chamber of Commerce, the Federation of British Industries, and the Executive Committee of the Scottish Coalowners' Association.

In general, these are all adverse to the Government proposals. Exception is taken to the details of grouping, but the main point seems to be that the action proposed would result in virtual nationalisation minus the name. One report emphasises the fact that the control proposed is very similar to that exercised by the Government of India over Indian railway companies, although there most of the railways are really owned by the State, whereas here they all belong to shareholders, who will have no guarantee even of the 1913 net revenue, while the Government, which proposes to share in "surplus profits," is not prepared to participate also in losses. In the case of Scottish railways the position is regarded as serious, as the increases in wages have been so much greater in proportion than in England, and most of the reports suggest association with related English railways, or a pool of revenue for a period of years until a standard basis of working can be agreed upon.

Proposals to include representatives of the workers on the board are not favoured, though one report is most inconsistent by advocating the presence of traders' representatives, but not of the workers. Neither or both is the only course in this connection, especially as the trading and industrial community is already well represented by many recognised shareholders' societies. There is general approval, however, of the suggestion that advisory councils composed of company, workers' and traders' representatives should be given considerable powers, and this is a much more satisfactory and practicable scheme. On the whole, the general view appears to be that, as compared with the Government proposals, railway companies are better able to carry out their own grouping schemes, and that they can as well, if not better, realise the alleged opportunities for effecting economies and improvements in working methods.

The Railway Rates Report.

THE first report of the Rates Advisory Committee on the general revision of railway rates and charges raises several important issues. In these days when so many criticisms are made, insinuating that railways are managed and operated inefficiently, it is refreshing to find that no fault is found with the general system upon which railway

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rates have been operated for so long, and that the leading principles upon which they are based are recommended for retention, while the modifications proposed are chiefly in the nature of changes to meet the new conditions which exist. Thus while it is proposed to do away with statutory maxima, there is to be a special tribunal which will exercise a corresponding though elastic control, this course permitting of adjustment as the general situation may demand, and in view of the uncertainties of the national trading and financial position, for which the rigid statutory maxima gave no latitude. Similarly the policy of "continuous mileage" advocated is in accordance with the grouping proposals; obviously, if railways are amalgamated into a few big concerns there will be fewer ownerships to complicate this question, while if railways are associated for operating purposes it will hardly be possible to maintain individual ownership considerations in regard to the building up of through rates.

Proposals to unify rates, co-ordination of the varying bases upon which distance charges are estimated, the regularisation of arrangements in regard to private sidings and the like, and the standardisation and adjustment of "exceptional" rates also represent factors which would require to be adjusted as between the components of associated or amalgamated companies, and in that sense, at least, represent necessities of the future, though now proposed on a general instead of a grouping basis.

Will the Railways or the Traders benefit most?

ONE point that is made very clear—indeed the report argues and elaborates it at great length—is the impossibility of ascertaining the exact cost of conveying a particular unit consignment by rail. An industrial establishment can do so in regard to its products with very close exactitude, but there are too many complicating factors in respect of railway traffic. In fact, it can only be approximated to in the case of special consignments, when the additional cost above that which is standard can be separated and thus used as a basis for study. But in the ordinary way a hundred and one complications may prevent even the law of averages being applied, while many operating factors cannot be dissociated, even as between the goods and passenger sections. And when the further necessity is added of charging rates in order to bring railway revenue to the suggested standards which will permit of a reasonable return upon capital being earned, the difficulties of the task to be faced by the tribunals which will have to settle the actual rates to be charged in future will be realised. It is, however, satisfactory to note that the Committee accepts the principle that railway shareholders are as much entitled to a reasonable increase in dividend returns as in the case of industrial and trading businesses.

The main question of the moment is, however, whether traders or the railway companies will benefit most by the proposed changes. On the face of it, traders receive very great consideration, and they will be afforded an appreciable share in the settling (and modification from time to time) of the new rates. In fact, the report suggests that rather too much consideration has been paid to the traders' side. After all, railways are private trading concerns, and it is not usual for outside agencies to exercise a voice in the settling of the charges made by selling corporations, the law of supply and demand operating very effectively on its own account. It is true that the Government has a certain hold upon railway companies which it does not possess on general trade and industry, but on its merits, and under normal conditions, that is not a very strong one, except in regard to matters of public safety and to ensure fair treatment.

On the other hand, as already suggested, several of the proposed changes are of a nature which would almost certainly have their corresponding, if not exact equivalents, under the prospective conditions of the near future; while the unification of rates, and particularly of exceptional rates, may operate as much in favour of the companies as of traders, and probably more so. The dissociation of transit, terminal and service charges is more a matter of method of stating charges and of book-keeping than an essential change.

Exceptional Rates.

It remains to be seen, however, how far the lower exceptional rates will rule the situation, while if those which in pre-war days were arranged to meet coastal water competition are not to be maintained at a competitive level there may be seriously adverse effects upon the railway traffic concerned. At present it may be desirable to restore coastal traffic by sea; but when that regains a normal status the railway situation may become a matter of concern. In railway circles, the phrase "what the traffic will bear," has wisely been interpreted as the charge which traffic can reasonably pay and which is profitable to the railway company, though in general business it often carries the inference which is best described as "profiteering." But in the case of railways many of these exceptional rates have been arranged in the light of very

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intimate knowledge and experience of the traffic concerned, and serious interference therewith may easily upset the whole traffic situation. The balance may, however, be substantially restored by the more elaborate classification which is proposed. It is certain that before the new classification and the new rates are finally settled there will be a great deal of study, and that the practical views of railway officers, as well as the opinions of representatives of trade and industry will be carefully considered. At the same time it is difficult to see how the desired estimates of net revenue can be arrived at, except by a process of "trial and error," adjusting in the light of experience and in accordance with the changing circumstances of the period. In other words, the Rates Tribunals of the future will have to feel their way and learn their lessons very much as railway officers have had to do in the past, but with the complication that there will be two bodies to be consulted, instead of one—the tribunals and the groups of railway officers actually dealing with the traffics concerned.

Lancashire and Yorkshire Railway School of Signalling.

A DISTRIBUTION of the prizes and certificates awarded to the students of the Lancashire and Yorkshire Railway School of Signalling in connection with the 1919-20 session took place at the Albert Hall, Manchester recently. Mr. Arthur Watson, C.B.E., General Manager, presided, and Mr. E. B. Fielden (Chairman of the Company), presented the awards. Messrs. R. W. Wickham, H. Tunstill, and J. W. Makant (directors) attended, and among the officers of the company present were Mr. R. C. Irwin, Secretary; Mr. Geo. Hughes, C.B.E., Chief Mechanical Engineer; Mr. Ashton Davies, M.B.E., Superintendent of the Line; Mr. A. de C. Parmiter, Solicitor; Mr. R. Sadler, Accountant; Mr. A. D. Lomas, Estate Agent; Mr. T. W. Royle, M.B.E., Assistant Superintendent of the Line; Mr. J. Taylor Jones, Assistant Solicitor; Mr. W. H. Coomber, Assistant Civil Engineer; Mr. T. A. Kenyon, M.B.E., Assistant to the General Manager; and Messrs. G. Hawkins and D. Halliwell, M.B.E., Assistants to the Superintendent of the Line.

DISTRIBUTION OF PRIZES, LANCASHIRE AND YORKSHIRE RAILWAY SCHOOL OF SIGNALLING.

Mr. Ashton Davies, Superintendent of the Line (on left of table); Messrs. J. W. Makant and R. W. Wickham, Directors; Mr. Arthur Watson, General Manager; Mrs. Fielden; Mr. H. Tunstill, Director; Mr. E. B. Fielden, Chairman (standing); and Mr. Hillyard Bruce, Winner of first prize in "Honours" section.

The school was established in 1910 to give facilities to the members of the various branches of the service to extend their knowledge of railway working. During the first session 100 students were enrolled. During the session just closed 1,421 were enrolled. With its present equipment the school is stated to be the finest in the country. In opening the proceedings Mr. A. Watson said he was gratified to see that the number of students attending the school of signalling was being well maintained, and he urged on the students the importance of sitting for the examination. They were fortunate in having with them the chairman of the com-

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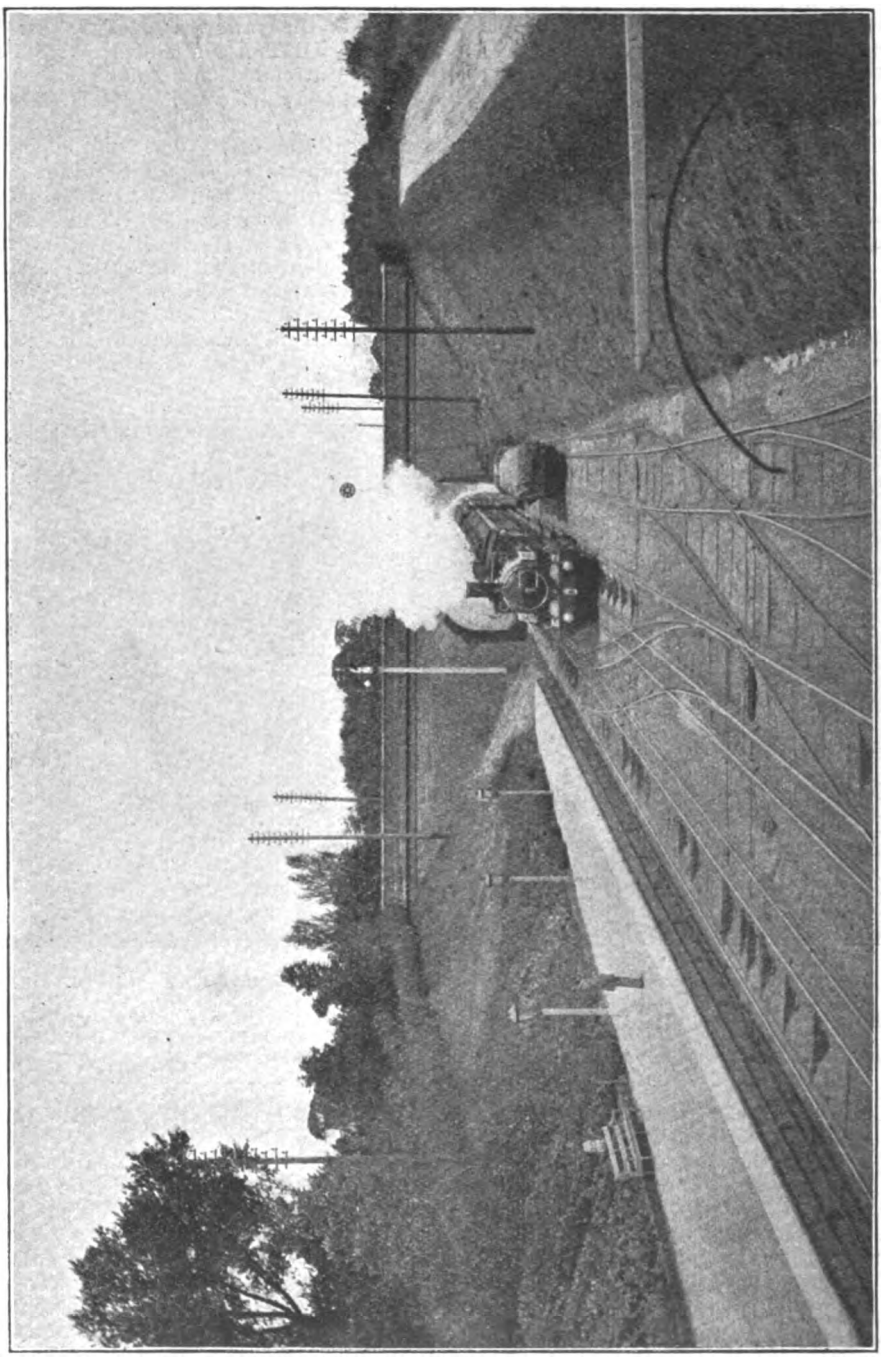

BROAD-GAUGE EXPRESS PASSING TWYFORD STATION, GREAT WESTERN RAILWAY, IN 1872.

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pany and some of the directors, and he wished to say that it was owing to their generosity that the Lancashire and Yorkshire Company had a school of signalling probably unequalled by any other signalling school in the world. He also desired, on behalf of the board, the officers and the staff, to thank the lecturers for their valuable work.

Mr. E. B. Fielden, on rising to present the awards, said it was a great pleasure for him to perform the presentation ceremony. Before doing so, however, he desired to extend to the Chairman the congratulations of the board on the appointment he had just received.* That might be well termed the "Blue Riband of the railway world," and he thought Mr. Watson was the only man in the English railway world who did not believe that the appointment made was the very best that could be made. He was glad to have the opportunity of meeting the students of the school of signalling. The company wanted efficiency above all, and to get this, facilities must be given to the men in the various departments to study the different phases of operation and acquire an intelligent understanding of their work. He remarked on the advantage to the students of widening their railway knowledge and stated that the success of an organisation such as the Lancashire and Yorkshire Railway, like success in anything else, depended upon individual effort.

In the examinations for the 1919-20 session, 207 students attended, and 186 or 89·86 per cent. passed. Since the inception of the school 2,041 students have passed the examinations out of 2,285 candidates, 575 having obtained first-class certificates, 893 second-class and 573 third-class. At the last examination there were seven distinct sections, viz. :—Honours, Advanced, Stationmasters, Signalmen, Passenger and Goods Guards, Intermediate and Preliminary, and the first, second and third in each section received a prize. The winner of the first prize in Class A (Honours) was Mr. Hillyard Bruce, District Passenger Superintendent's Office, Halifax, who obtained 380 marks out of a possible 400; while Mr. George Leather, Office of Superintendent of the Line, was first in Class B (Advanced) with 387 marks out of a possible 400. Altogether 15 valuable prizes were awarded, together with 186 handsome certificates.

Twyford Station in 1872 and 1920.

On every railway photographs showing the same station at dates widely apart reveal changes of an essential and interesting character, but in the case of a line such as the Great Western, where intervening years have involved not only the developments due to time but also the alterations incidental to a great transformation such as that due to the abandonment of the broad gauge, the comparison becomes distinctly remarkable.

We are indebted to Mr. John Campfield for the photograph reproduced on the opposite page, showing Twyford Station as it was in 1872, and by courtesy of Mr. Charles Aldington, C.B.E., General Manager of the Great Western Railway, we are enabled to associate with this a corresponding view (see next page) of the station as it is to-day. The early photograph shows very clearly the dual gauge track laid on longitudinal sleepers, while the lay-out of the cross-over road and of the siding is worthy of close attention. The train is a standard broad-gauge express of the period drawn by one of the well-known 8 ft. singles of the "Lord of the Isles" class.

The present station has long been four-track. It is prettily situated, while the bushes and shrubs on the platform add to its artistic appearance.

Auto-Train Working on the Great Eastern Railway.

Commenting upon a reply in "The Why and the Wherefore" for October, Mr. G. T. Ladd supplies some interesting remarks concerning auto-train working on the White Hart Lane-Cheshunt line of the Great Eastern Railway, now closed for ordinary traffic. "From 1915 until last year, an auto-train worked between White Hart Lane and Cheshunt *via* Lower Edmonton and Forty Hill, making trips, early morning, mid-day and evening, including Sundays. The first year or so the train was composed of two bogies, and one of the special auto 2-4-2 tanks, the train being driven from either end. The latter part of the time the engine was a 0-6-0 tank; sometimes one of the comparatively new 0-6-2 tanks, Nos. 1000 or 1001 was used. These engines always ran round the train at the terminus. The service was provided chiefly for the convenience of the munition workers employed at the numerous factories built during the war."

Saltburn-Scarborough Section, North Eastern Railway.

Mr. Hopwood's article published in the November Railway Magazine has elicited letters from Mr. T. Horn and Mr. H. R. Gale which, with the author's comments, include features of interest.

Staithes Viaduct has a wind gauge upon it, as a precautionary measure. No train is allowed to cross when the gauge registers 28 lb. per sq. in. or more. There is a similar gauge on Belah Viaduct. Staithes is the

* As General Manager of the London and North Western as well as the Lancashire and Yorkshire Railway.

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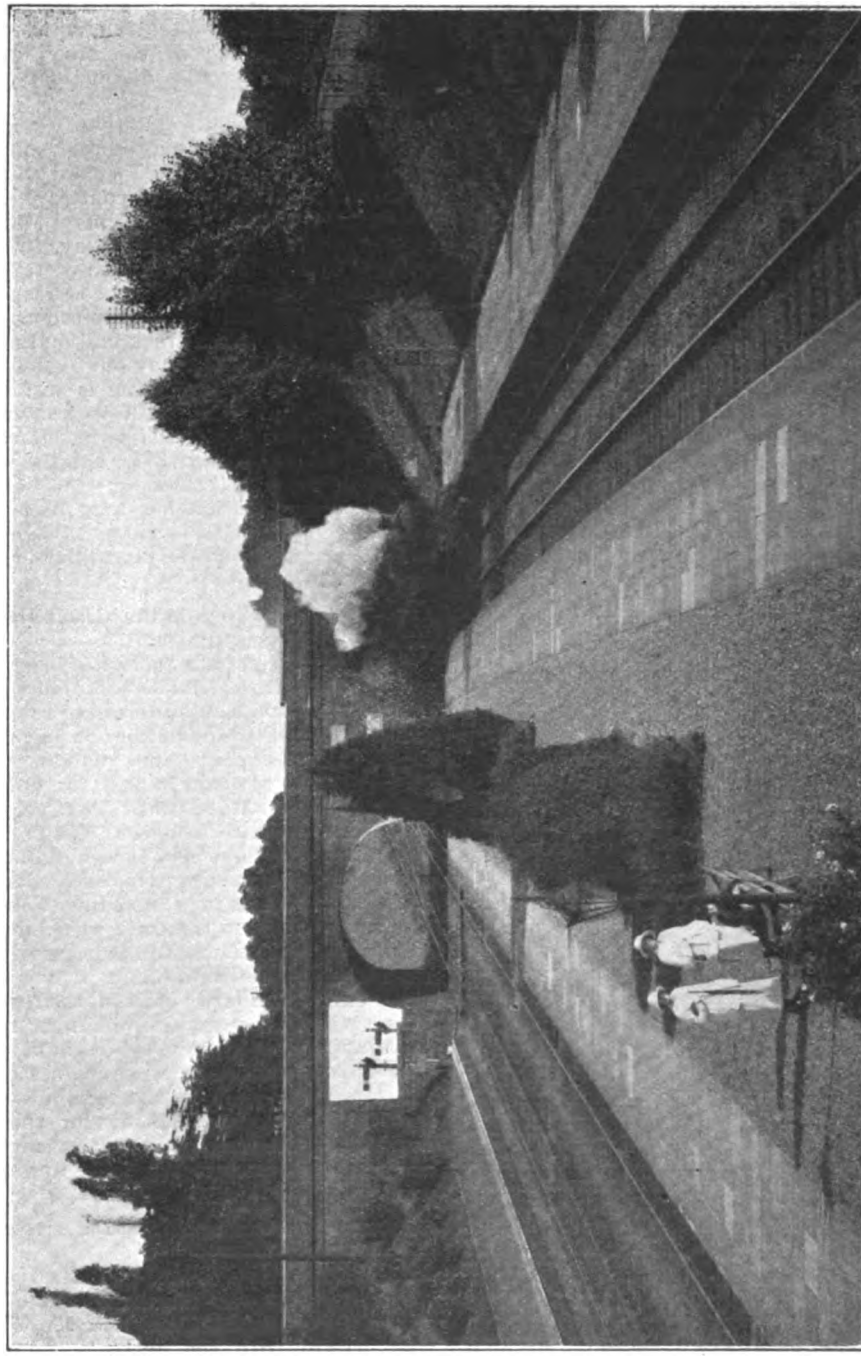

TWYFORD STATION, GREAT WESTERN RAILWAY IN 1920.

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longest viaduct on the branch, but not in regard to the North Eastern system as a whole. Deepdale and Belah (106 ft.) are longer, the latter holding the premier position. See article in the February, 1920, RAILWAY MAGAZINE. Mr. Horn comments upon the fact that Kettleness and Sandsend tunnels are unusually close to the cliff face, Mr. Hopwood suggests that cliff falls since they were made may probably account for this. In the latter tunnel there are two horizontal shafts to the cliff face. Prospect Hill Junction is thought to be unique in that the three converging single lines are graded at 1 in 60, 1 in 58 and 1 in 50 respectively. Ravenscar was originally called "Peak" Station, but the date when the change was made is not known.

In regard to the locomotive working there seem to be differences of opinion. Mr. Hopwood, in July, 1919, refers to MacDonnell 0-6-0 tender goods engines on passenger trains, and travelled twice with 4-4-4 tank engines between Whitby and Scarborough. He also saw two of the old 1001 class goods engines. Mr. Horn mentions 0-4-4 tank engines in pre-war days, followed by auto-trains, and later the 4-6-0 tank engines rebuilt as 4-6-2's, the 4-4-4's between Saltburn and Whitby, and larger 0-6-0 engines, as well as the 1001 class, on goods trains. He has also seen 4-4-0's, but very exceptionally. Mr. H. R. Gale refers to the 4-4-4 tanks as being too heavy for regular use, the 4-6-2's being now usual, with some of the 0-4-4 engines. He also points out that the standard trains are now made up to five instead of four large coaches.

Mr. A. H. Tatlow on South African Railways

IN the course of an address delivered to the South African section of the London Chamber of Commerce, Mr. A. H. Tatlow, Publicity Manager, South African Railways and Harbours, pointed out that it is now 60 years since the opening of the first railway in South Africa, namely, the short section, a little over a mile long, between the Point and Durban. In round figures the present mileage (practically all single line) owned or more or less controlled by the South African Railway Administration, is 11,500 miles, being in point of mileage one of the largest singly administered railway corporations in the world. The staff (European and coloured) employed number 85,000. The average weekly earnings are in the neighbourhood of £465,000, the expenditure on capital up to the end of the last financial year about £10,000,000.

In comparison with other countries the Union is generously provided with railways. Indeed, in two countries only, Western Australia and Queensland, are there more miles of railway in relation to population than there are in relation to the white population of South Africa. There is one mile of railway for every 147 European inhabitants in the Union. In relation to area the Union compares favourably with other new countries.

As was to be expected in these trying times, the Railway Administration has been subjected to a good deal of criticism. But all over the world railway organisations are under a cloud. Throughout the war period praiseworthy forbearance was shown. Restrictions and curtailed railway facilities were borne as inevitable. With the cessation of hostilities it was somehow assumed that the difficulties of the railways were automatically ended. That is not so In South Africa, rolling-stock, improvements to main line, increase of siding accommodation and terminal facilities, larger workshops, more machinery, more engines and trucks are needed. They are being provided as rapidly as possible. One hundred large locomotives are being delivered or are under construction, 285 coaches are also in hand, and 3,900 wagons. The locomotives cannot at present be made in South Africa, but about 50 per cent. of the work on carriages and from 20 to 25 per cent. of the work on wagons is being done there.

Changes in South African Traffic.

ECONOMIC conditions in South Africa to-day are very different from what they were a few years ago. Then thousands of trucks had to be worked empty to the ports to carry imported traffic to the interior. To-day that position is reversed. Owing to the enormously increased agricultural and manufacturing production of the Union, train loads of empty trucks are now hauled daily from the ports to the interior to carry our large and growing export traffic. In other words, between 1910 and 1919 goods traffic in the Union has increased by over 70 per cent., coal traffic by 45 per cent., and passenger traffic by over 80 per cent., but in the same time the imports carried by the South African Railways have dwindled to nearly one-third of what they were. Thus the railways are to-day carrying mainly low-rated traffic—such as the products of the country—and not comparatively high-rated imported traffic as of old. That is a good thing for the country, but it embarrasses the railway revenue, especially at a time when working costs have greatly increased and the purchasing power of the sovereign is much reduced. When everything is considered, not much can be urged against the claim that the increase in tariffs was imperative.

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The main trunk lines of the South African Railways were built by various authorities to obtain a share in competitive traffic in the days when the problem was how to obtain traffic. Now that the problem is how to cope with the traffic offering the railway authorities are faced with the big task of having to remedy great defects in the original construction. Much is being done in the way of strengthening the lines and bridges, so that heavier loads might be carried per train; and in reducing curves and gradients, so that greater speed may be obtained. The work goes on as fast as possible, and the result, as in the hill sections of Natal, will be to increase by about 75 per cent. the carrying capacity of certain busy sections of the lines. Further considerable relief will be secured on the electrification of certain sections of the lines which is now contemplated as from Durban to Maritzburg and Cape Town to Simonstown.

Rule 55.

In view of the interest which is being taken in the means which are being adopted to render it unnecessary for firemen or guards of trains kept waiting at a signal to proceed to the box as a reminder to the signalman in accordance with this rule, and the number of queries dealing therewith, which have received attention in "The Why and the Wherefore," we are pleased to add to our replies a fuller explanation, for which we are indebted to Mr. T. S. Lascelles, of the W. R. Sykes Interlocking Signal Co., Ltd. He points out that the diamond boards which have attracted so much attention indicate only that the signals concerned are exempt from Rule 55, but the required protection may be obtained by track circuit, or by other means securing the same end. He writes: "The London, Brighton and South Coast Railway have now equipped the whole of their signals (except distants, of course, or signals in sidings) from London to Balcombe and Dorking—or soon will have done so—but track-circuit exists only at a very few of these signals. The diamond indicates track-circuit or *equivalent apparatus*, so that whenever the "Lock-and-Block" is in use, these plates are fitted, all signals on the sections so worked being exempt from the famous rule."

Old Scottish Locomotives still at work.

Mr. J. D. Sherriffs, of Arbroath, sends a few notes concerning old locomotives still at work on the Caledonian Railway He writes: "At Forfar, acting as spare engine, is an old 7 ft. 2-4-0, No. 1035. This engine I understand, is the last relic of the famous Connor 2-4-0's. She was originally No. 35, but was put on the duplicate list in 1913. This engine works regularly on the various branches radiating from Forfar. At Arbroath just now, there is an old 0-4-2, No. 255, acting as shunting engine. Several of the class are at Dundee, including No. 1674. No. 1676 was at Arbroath until recently, but is at present in the shops. We have still several specimens of the old Oban bogies in the district. No. 1186 works goods regularly between Dundee and Forfar, *via* Arbroath, while another is at Blairgowrie. The old Drummond 0-4-4 tanks are, as a class, still intact. There are some half-dozen at Forfar, while No. 191 works the Arbroath and Carmyllie branch. No. 1231 is at Brechin and No. 1227 at Montrose."

Athletic Honours and the Railway Service.

It may be said that the ramifications of railway work are so wide that the railway service constitutes a world in itself. Certain it is that on the athletic side the railway service is well able to hold its own in competition with workers in other industries, and special interest attaches to a recent presentation at the head offices of the London, Brighton and South Coast Railway at London Bridge, made by Sir William Forbes, General Manager to Mr. Albert G. Hill, on behalf of some 1,700 of his colleagues on the line, in recognition of his prowess at the recent Olympic contests at Antwerp. The presentation took the form of an illuminated address, suites of bedroom and dining room furniture and a stop-watch, together with a handsome gold bracelet for Mrs. Hill.

In the course of his speech, Sir William Forbes mentioned that when Mr. Hill came to him and told him of his desire to enter the Olympic contests, and do his best to win at least one great event, he agreed and gave him a month's rest in order to prepare for the ordeal, and, with an aside, told him, should he fail in his ambitions, not to show his face to him again. As results had proved, he (Sir William) was pretty safe in urging that injunction. It will be recalled that Mr. Hill won for Great Britain two world championships—800 met. in 1 min. 53⅘ sec., and 1,500 met. in 4 min. 1⅕ sec.—this being the only occasion on which two Olympic championships had been secured by the same man on behalf of Great Britain. Mr. Hill, who is in his thirty-second year, commenced running in 1906, and in 1907-8-9 won the North London Junior Cross-Country Championship, 5½ miles, the only occasion on which that championship had been won in three successive years by the same person. Among other championships gained by Mr. Hill were the ½ and 1 mile of England in 1919, while in 1920 he broke the 1,000 yards Scottish record. His other achieve-

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ments include 13 club championships. During the war Mr. Hill joined the Royal Air Force and served for three years in France as a wireless operator, being demobilised in December, 1918. Sir William concluded by remarking that they were exceedingly proud of an official of the line who had such an excellent record, and they all wished him success in the future. In replying, Mr. Hill thanked Sir William for his kindness in allowing him time in which to train for the races, and said that without such elaborate preparation he could not have hoped to succeed.

Topical.]

SIR WILLIAM FORBES, GENERAL MANAGER, LONDON, BRIGHTON AND SOUTH COAST RAILWAY, MAKING THE PRESENTATION TO MR. A. G. HILL, WINNER OF TWO OLYMPIC CHAMPIONSHIPS.

Mr. Anderson proposed a vote of thanks to the General Manager, remarking that Sir William Forbes, as they were all aware, shared their joys and sorrows. In acknowledgment, Sir William said that it always afforded him great pleasure to recognise merit on the part of any of those with whom he worked. He was a thorough believer in sport, and in his younger days went in for it seriously. He was reminded by the present occasion that in the Victorian days he managed to do the ½ mile in 2 min. 10 sec., which, he thought, in those far-off times, was considered quite a good performance. There was nothing like keeping oneself fit, and a serious turn in athletics between 18 and 25 went a long way towards preserving health in the later years of one's life.

There was a large and enthusiastic attendance at the function, the arrangements for which afforded testimony to the efficient organisation for which Mr. G. H. Dennis, of the Publicity Department, had been responsible.

Articulated Locomotives.

At a recent meeting of the Institution of Locomotive Engineers, Colonel E. Kitson Clark, Chairman of the Leeds Centre, provided a comprehensive paper on this interesting phase of locomotive engineering practice. In general the paper was a review of locomotive development with particular reference to its evolution in articulated forms, but a number of interesting points were raised, while his chronological review included some useful data from which the principal facts may be extracted.

Commencing with a reference to a design of George Stephenson, in which engine wheels were driven in the usual way and tender wheels by an endless chain, the lecturer went on to refer to Horatio Allen's double-boiler double-bogie design built in 1831 for the South Carolina Railroad. In 1840 Matthias Baldwin obtained several patents, including flexibly-arranged sets of coupled wheels to meet the requirements of curved mountain railways. In 1852 the Austrian Government instituted a competition for locomotives to suit the curves of the Semmering Incline. The Maffei engine included the Stephenson principle of 1815 by coupling the tender wheels through an endless chain. In 1852 Cockerill and Co. distinctly anticipated the jointed type of the future, a double boiler being carried on two steam-driven bogies.

Dealing with the Fairlie type, Colonel Clark expressed the opinion that this design proved the real beginning of the practical history of the articulated locomotive. This includes two bogies, and, when both are steam driven, a double boiler, though the Vulcan Foundry Company have built a design in which the two boilers are quite separate. In 1863 the Sturrock steam tenders appeared on the Great Northern Railway. Referring to the Meyer type, introduced first on the Northern Railway of France in 1869, the principle was a superstructure consisting of boiler, coal bunker and water tank supported upon two steam-driven bogies.

In 1875 twin engines were made by Kitson and Co. for the Cape Government Railways, which were practically two similar engines coupled back to back. In 1914 the method of using twin engines, capable of acting as separate entities, was worked out in an interesting patent by Stephenson

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and Co. In 1887 F. W. Johnstone introduced on the Mexican Central Railway two sets of flexibly mounted coupled wheels, driven through a lever system from cylinders on the main frame.

The Mallet and Garratt Types.

In 1887 Mons. Anatole Mallet introduced the type which bears his name. In this case the rear coupled wheels are mounted on the main frames and the leading set in a radially movable frame articulated to the main frame. The lecturer then described various examples of the Mallet type in more recent years, both British and American, referring also to the Henderson design with steam-driven bogies fore and aft of the main frame.

In 1894 the Hagans design was introduced, with a system of levers to provide for flexibility. In that year Mr. Robert Stirling, of the Anglo-Chilian Nitrate and Railway Company, suggested to Kitson and Co. a design on the lines of the Meyer type, and this general principle, known as the Kitson-Meyer type, has been used for a number of notable engines since. The Krauss motor bogie, with a supplementary driving axle carried on the leading bogie to provide additional power, would seem to indicate the articulation quality. A somewhat similar engine had been made about two years previously by the Baldwin Locomotive Works.

In the Klein-Lindner design the end-coupled axles maintain parallelism with the other coupled axles, but the end pairs of wheels adjust themselves on curves by a quill driven from the centre of the axle. The "Shay" locomotive is carried on three four-wheeled trucks, each right-hand wheel of which carries a toothed rim engaging with a pinion on a horizontal flexible shaft driven from vertical cylinders.

The Garratt system, introduced in 1912, having two trucks supporting a boiler which, as it were, bridges from one to the other, has been used for a number of notable designs. In 1912, Livesey, Son and Henderson were responsible for a design combining the functions of an adhesion and a rack engine in respective steam-driven bogies. Reference was made to engines of this type built by Kitson and Co. for the Transandine Railway.

The author then made some remarks concerning special electric locomotives used on United States Railways in which the articulated principle is included He then discussed the main features of articulated locomotive development, concluding by expressing the opinion that the Kitson-Meyer type affords the desirable mean in that it gives a clear firebox, its centre of gravity on a sharp curve is within the arc, resisting the tilt of centrifugal force, and its bogies twist easily round their centres in the generally accepted fashion. The quality of easy movement can be definitely modified by springs to counteract where required the lateral oscillation of the engines.

London & North Western Railway Locomotives.

Mr. C. Williams, of Crewe, writes stating that a further series of four-cylinder "Claughton" class locomotives is now being turned out at Crewe, as follows :—Nos. 2059, 1326, 2090, 2095, 2101, 6, 8, 10, 11 and 13 (Crewe Nos. 5532–5541 inclusive). Of these, No. 2059 bears the name *C. J. Bowen Cooke*, after the late Chief Mechanical Engineer. Another batch of similar engines is about to be put in hand. Respecting the 2–8–0 mineral engines (R.O.D. type) which were taken over on loan from the Ministry of Munitions, 30 of these have now been purchased and are being renumbered in the London & North Western list as follows :—Nos. 2800–2829, altered to 1315, 1317, 1336, 1337, 1347, 1348, 2039, 2041, 2048, 2071, 2079, 2093, 2099, 2100, 2102, 2103, 2108, 2109, 2389, 2394, 2400, 2402, 2404, 2406, 2407, 2413, 2439, 2444, 2447 and 2451, respectively. The engines replaced, which are all of the 0–6–0 saddle-tank coal class, have been transferred to the duplicate list as Nos. 3671–3700 inclusive, in the order given.

A total of 51 new engines, including 40 of the "Claughton" class (not 30, as stated by Mr. Allen in his January article) were constructed at Crewe during the past year, the remaining 11 being of the "Prince of Wales" class, completing an order for 15. In addition, about 15 engines were reconstructed and brought into line with present-day requirements. All things considered Crewe's record for the year was a good one in comparison with those of the pre-war period. No. 1038 is the latest four-cylinder compound mineral engine to be simplified and superheated. In the course of its career as a compound this engine underwent several changes. In December, 1905, it was provided with a small pair of leading wheels, the object being to equalise the excessive weight hitherto carried on the leading pair of coupled wheels. Later, in April, 1907, it was rebuilt with a larger boiler, in which condition the engine remained until recently, when, as above stated, it was altered to simple, the small pair of wheels with which it was previously fitted being then dispensed with. No. 1977 *Mars* has been converted from four-cylinder compound to two-cylinder simple, "Renown" class.

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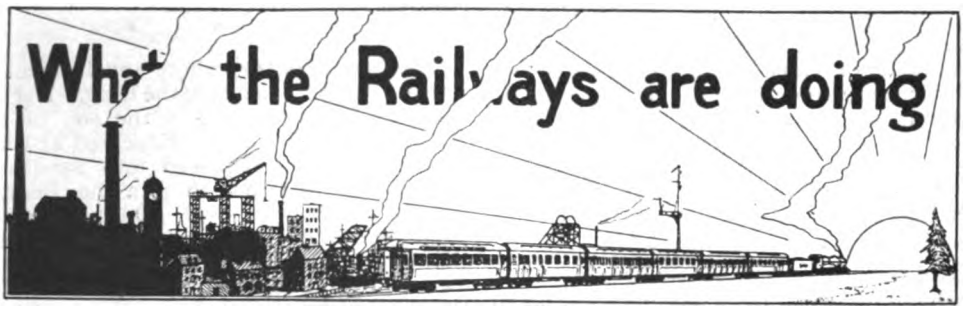

MR. R. TRISTRAM HARPER, who has been appointed Secretary to the Buenos Ayres Great Southern Railway, rendered vacant by the retirement of Mr. A. Giet, is well known in the City, having practised as a chartered accountant for some 10 years before the war. Mr. Harper, who was born in New Zealand, served in the South African War with the Yeomanry, gaining the Queen's Medal with three clasps, and the Royal Humane Society's vellum for gallantry in saving life in the Vaal River. He also served throughout the Great War in Egypt, Macedonia and France, being twice mentioned in despatches, and awarded the O.B.E. (Military Division), and reached the rank of lieutenant-colonel. Immediately on his retirement from the Army in October, 1919, he was appointed Assistant Secretary to the Buenos Ayres Great Southern Railway, and has since spent several months in the Argentine, when he was able to familiarise himself with the company's system. Mr. Harper qualified as a chartered accountant in 1905, and was admitted a Fellow of the Institute in 1910.

Elliott] [*& Fry.*

MR. R. TRISTRAM HARPER,

Secretary,
Buenos Ayres Great Southern Railway.

* * *

MR. W. STRUTT of the Chief Goods Manager's Office, Great Central Railway, who retired from the service at the end of 1920, after having completed practically 51 years' continuous service, (49 years of which were spent in the Chief Goods Manager's Department), was presented by the Chief Goods Manager and Staff with a wallet containing currency notes. Mr. J. Rostern, C.B.E., the Chief Goods Manager, in making the presentation, said that he had known Mr. Strutt for over 40 years and was able to say that during this period Mr. Strutt's duties had been carried out faithfully and well, and he had endeared himself to everyone with whom he had come in contact, and expressed the wish that although he was leaving the company's employ, Mr. Strutt would make a point of attending functions connected with the Office, and hoped that he, with his wife and family, would have long life, health and happiness.

* * *

MR. CHARLES NEWTON MANSFIELD has been appointed London Mineral Agent for the Midland Railway, succeeding Mr. William Henry McConkey. He entered the service in the Mineral Manager's Department, Derby, in 1900, and was appointed Assistant Canvasser, Leeds District, in 1912, and Mineral District Agent, Manchester, in 1913. Mr. Mansfield joined His Majesty's Forces in 1915, and returned to railway life in 1920. In the Army he was connected with the Railway Department of the Royal Engineers, and rose to the rank of Major.

* * *

MAJOR C. L. CONACHER, O.B.E. (formerly General Manager of the Isle of Wight Central Railway and Traffic Manager of the Cam-

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brian Railways), whose association with the Ministry of Munitions dates from June, 1915, when the Department was first formed, has now been appointed Superintendent for the liquidation of Ministry establishments in the Western area, comprising the West and South of England and South Wales. Until recently Major Conacher was acting in that capacity for the area south of the Thames, and he assumed his new post, with headquarters at Swindon, on January 1.

* * *

THE Superintendent of the Line and staff (past and present), South Eastern & Chatham Railway, held a very successful re-union and dinner at the Cannon Street Hotel on Tuesday, January 4. The dinner was the 11th of its kind, and but for the intervention of the war, would have been the 16th. The chair was occupied by the Superintendent of the Line, (Mr. Edwin C. Cox, C.B.E.), and the company present numbered 101, including Mr. H. A. Sire, C.B.E., Goods Manager, London, Brighton & South Coast Railway (a former Assistant Superintendent of the Line), Mr. J. C. Taylor (of Messrs. McCorquodale & Co., Limited), Mr. H. E. O. Wheeler, O.B.E., (Assistant Superintendent of the Line). Mr. H. H. Hayter (Chief Outdoor Assistant), Messrs. Ellender, Missenden and Latham (District Superintendents), Mr. E. E. Thomas (late District Superintendent), and Messrs. E. W. Honeysett, H. W. Dunk, M.B.E., E. C. Blanchard, A. H. Bourn, A. T. Browning, F. Browning, P. C. Hopper, M.B.E., (Station Superintendent, Victoria) also 16 ladies (past and present members of the staff). The dinner was excellently served by the Cannon Street Hotel staff, after which an impromptu concert was held. It was generally agreed that the gathering was one of the most successful of its series, and the efforts of the committee were duly acknowledged in a happy speech by Mr. H. H. Hayter, and received with acclamation. Mr. F. C. Bishop responded on behalf of the Committee, which consisted of Messrs. F. C. Bishop, W. Crawford, T. S. Todman and the Misses B. Buckland and D. A. Dominy.

* * *

MR. FRANK HEYS GILLIES, Secretary, Glasgow & South Western Railway, has retired after nearly 49 years' continuous service. Mr. Gillies joined the secretary's staff as a junior clerk in 1872. Appointed registrar in 1886, he became Secretary in 1892. At a dinner in St. Enoch Station Hotel, when a farewell presentation was made, Mr. David Cooper, General Manager, who occupied the chair, made reference to Mr. Gillies' long, faithful and able service, and expressed the hope that he would be spared for many years in health and strength to enjoy freedom from business cares and worries.

* * *

MR. CLAUD ISMAY, whose appointment as General Traffic Manager of the Bengal-Nagpur Railway is announced, is the son of the late Sir Stanley Ismay. Educated at Cheltenham College and passed into Sandhurst in 1895, he went out to join the Bengal-Nagpur Railway in 1896. During the first nine years, he was attached to various districts of the railway as an Assistant or District Traffic Superintendent. In 1904, he was transferred to the head offices, as Acting Superintendent of Transportation, and was brought into touch with administrative matters. In 1907, he was made permanent Superintendent of Transportation, and later

MR. CLAUD ISMAY,
General Traffic Manager,
Bengal-Nagpur Railway.

Superintendent of Goods. While holding the position of Superintendent of Goods, Mr. Ismay took over the duties of General Traffic Manager during the absence of Mr. A. M. Clark, the permanent incumbent, and from 1917, he acted continuously in this capacity until he now receives the definite appointment to succeed Mr. Clark, who joins the Railway Board.

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MR. FRANK BROWN, General Manager's Assistant, Alexandra (Newport and South Wales) Docks and Railway Company, recently presided at a gathering called for the purpose of presenting a parting gift to

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Mr. Arthur J. Coles, Chief Rates Clerk (General Manager's Department), on his leaving the service to take up an appointment with the Ship Canal Portland Cement Manufacturers, Limited, at Ellesmere Port, Liverpool. In making the presentation, Mr. Brown said Mr. Coles joined the service early in 1915, after having been about 15 years with the London & South Western Railway, where he had been chiefly engaged in the Goods and Rates Departments, and had also acted as Assistant Secretary of that excellent institution the London & South Western Orphanage. He came to the Alexandra Company with the highest credentials, and since he had been with them he had made a very large number of friends. Mr. Coles had had charge of several important sections of the head office work, and he

THE LATE MR. NEVILLE PRIESTLEY.

Managing Director,
South Indian Railway Company.

(Mr. Brown) would like to take the opportunity of acknowledging the loyal service Mr. Coles had rendered. Mr. Coles had the happy faculty of making friends, and he felt sure he was held in the highest regard by all the Alexandra Company's staff.

* * *

Mr. Neville Priestley, late Managing Director of the South Indian Railway, whose death was recently announced, had a life long experience of Indian railways, dating from the time when he joined the Traffic Department of the Indian State Railways in 1879. In 1884, he was appointed Division Superintendent on the Rajputana-Malwa State Railway, and continued in that position, varied with periods of duty at headquarters, till 1897, when he was selected by the Southern Mahratta Railway for the position of Traffic Manager. In 1900, he was called up to Simla to fill the position of Under-Secretary to the Government of India in the then Railway Department. During the winter of 1902–03, Mr. Priestley assisted the late Mr. Thomas Robertson in procuring the information for and in preparing his report on Indian Railways, and in the summer of 1903, Mr. Priestley was deputed by the Secretary of State to report on the organisation and working of railways in America. This famous report is still highly valued by those who are fortunate enough to possess a copy of it. The Indian Railway Board, created in 1905, on the suggestion of Mr. Robertson, had Mr. Priestley as its first Secretary, but in March, 1906, Mr. Priestley relinquished this post in order to take up the appointment of Agent of the South Indian Railway, a position which he held until he came home to join the Board of Directors in England. He was appointed Managing Director in February, 1910. A scheme which Mr. Priestley had very much at heart, was the linking up of the Indian and Ceylon Railways by way of Adam's Bridge. He was also a strong advocate of the promotion of branch railways in South India. Whilst in India he took a keen interest in the Volunteer movement, and was Honorary Colonel of the South India Railway Volunteers. During the war, Mr. Priestley lost his elder son, who was a Second Lieutenant, Rifle Brigade. In 1918 Mr. Priestley contributed to the *Nineteenth Century* an exhaustive review of the question of "Co-partnership *v.* Labour Unrest," in which he advocated bringing together capital, labour and the State in one great co-partnership as the true and only remedy for industrial unrest.

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As we go to press with this February Railway Magazine, we are advised that a complimentary dinner is to be given to Mr. James Wright, in celebration of his forty-two years' service with the London & North Western Railway. The event will take place at the Hotel Cecil, London, on Saturday evening, January 29, and Mr. Wright will be presented with an illuminated address and a piece of old silver. Mr. James Wright has, for a long course of years, been well known throughout theatredom as the popular theatrical agent of the London & North Western Railway and his portrait appeared in the Railway Magazine in September, 1912. Mr. Austin Brereton is the hon. secretary of the dinner committee and

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conditions resulting from the effects of the war and, as far as tranport is concerned, from decreased efficiency of railway rolling-stock, &c., which, after the enormous effort sustained during the war, is now in urgent need of repair, we are also faced by a fuel problem which for Italy is of exceptional gravity, Italy being entirely dependent upon other countries for her coal supplies. Before the war the approximate total amount of coal required annually for our industries, railways included, was about twelve million tons and was supplied by the British market. For our railway engines only the best Cardiff coal was used as it possesses a high calorific power and leaves a minimum of ash. Our locomotives, especially the superheaters and firebars were adapted for burning this kind of fuel, which gave the greatest power and enabled regularity of the train services to be maintained. During and since the war, however, we were compelled to use various kinds of coal of very inferior quality, purchased first from France and afterwards from Germany. It contains a large amount of waste matter and has the drawback, above all, of obstructing the firebars owing to the fusion of the residue, thus impeding regular combustion and rendering it necessary to clear the furnace at frequent intervals. Even the English and American coal, which we now receive in greatly reduced quantities is not of the best quality The use of these inferior grades of coal is naturally bound to affect the service of passenger and goods trains and obviously to hinder the endeavours of the Italian State Railways in restoring the rail services to their former efficiency. It is, therefore, most important that England, our old friend and ally, should come to our assistance by selling us, at a fair price, as much good coal as she can and enable us to overcome these difficulties as soon as possible.

* * *

In an article entitled "Off the Beaten (Railway) Track in London" (Railway Magazine, February, 1919), reference was made to the original Kew station of the North and South Western Junction Railway. Although disused for the long period of 58 years, the building still stands, and is illustrated by the accompanying photograph, which was taken in July last. The main line of the North and South Western Junction Railway was opened from near Willesden, on the London & North Western Railway, to Kew Old Junction on the London and South Western Railway, on August 1, 1853; and almost, if not actually, from that date, the North London Railway worked their trains over it. From June to October, 1854 they ran a service to Windsor (London & South Western station), via Kew, and afterwards to Hounslow only. In 1860, however, the Hounslow trains were diverted

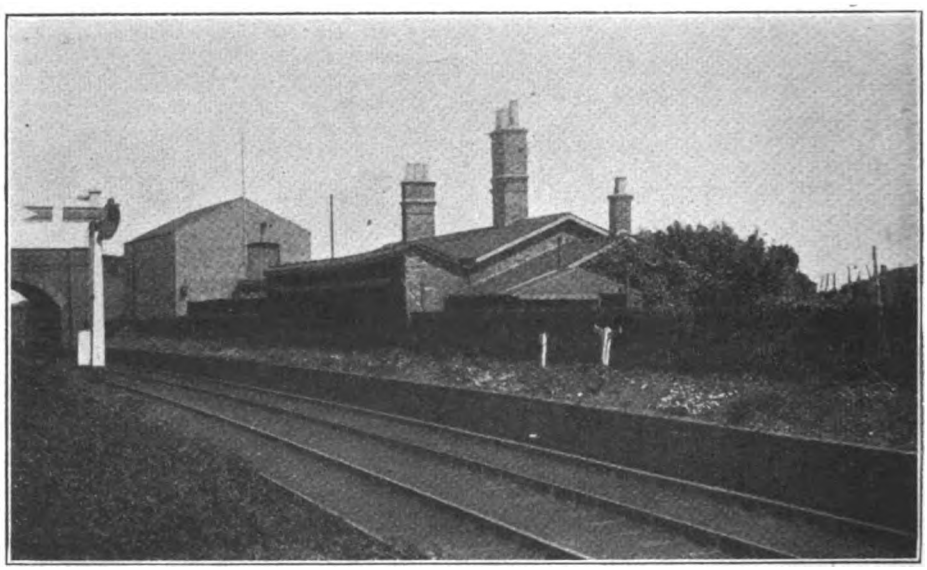

Photo.] [*H. L. Hopwood.*

KEW STATION, NORTH AND SOUTH WESTERN JUNCTION RAILWAY.

Disused since 1862.

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to Twickenham, being reversed at Kew and worked forward from there by London & South Western engines. In 1862 the London & South Western Company constructed the line known as Kew Curve, together with additional platforms at Kew Bridge station, for North London trains, and from that time the present station has been used. This avoided the reversal at Kew Old Junction and rendered unnecessary the original Kew station, which, therefore, was in existence as a passenger station for only nine years. It is curious that it should still be standing after 58 years of disuse, but this is explained by the fact that it is now a dwelling house. The view is taken looking towards Acton and shows the down platform On the up side, nothing now remains but the platform wall. The line through the station (from Kew East Junction to Kew Old Junction, a distance of 42 chains) is open now only for goods traffic.

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RECENT Railway Club activities include a highly-successful annual dinner at the Holborn Restaurant and a very interesting lecture illustrated with lantern slides at the club headquarters, 65, Belgrave Road, S.W.1. Mr. W. Parker presided at the dinner, while Mr. R. L. Burge was responsible for the lecture, his subject being "The Development of the Modern British Express Locomotive." On Friday evening, February 11, the annual general meeting of members will be held, followed by a paper by Mr. H. L. Hopwood, who will deal with "Ten Years' Progress at Doncaster Works, G.N.R."

* * *

IN connection with the Institute of Transport, a meeting was held at the Institution of Civil Engineers, Great George Street, London, S.W.1., on Monday, January 17, 1921, at 5.30 p.m., when Mr. Marshall Stevens, M.P. (Chairman, Trafford Park Company), read a paper, entitled "The Manchester Ship Canal as a factor in Transport."

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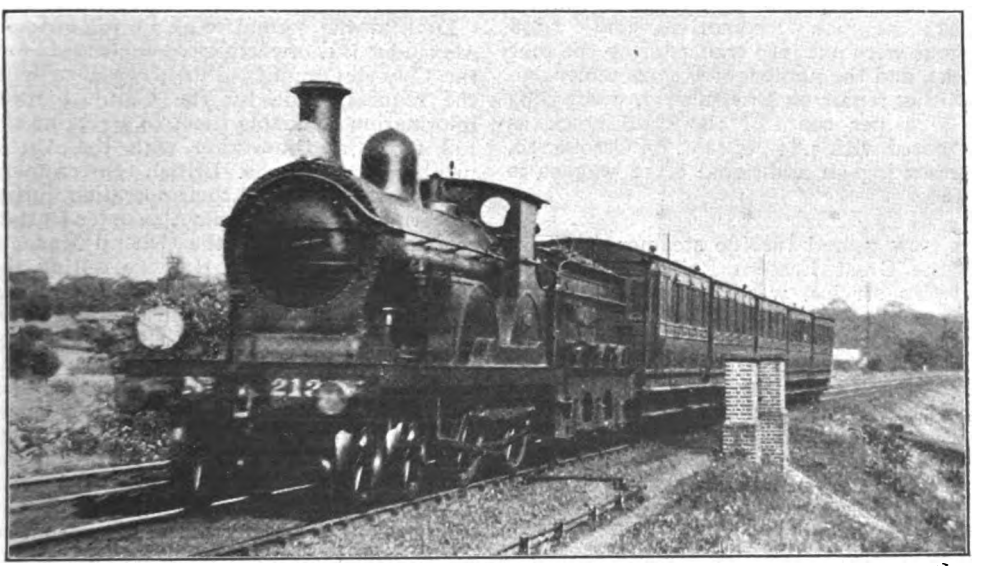
THE 11th issue of "Railway Statistics" (on sale at H.M. Stationery Office, price 1*s.* 6*d.*) has just been published by the Ministry of Transport, and contains, for the first time, an analysis of the parcels and miscellaneous traffic charged at passenger train rates. The total receipts for all railways in Great Britain from this source during the month of October amounted to £1,410,899; the average charge for conveying milk, works out at 1·69*d.* per gal., fish ·37*d.* to ·51*d.* per lb., according to class, meat ·35*d.* per lb. and poultry ·61*d.* per lb. Owing to the normal falling off in holiday traffic, and the coal strike, the number of passengers conveyed (exclusive of season ticket holders), declined from 127,183,128 in September to 115,013,927 in October or 9·6 per cent., and the average receipts per passenger journey fell from 15·48*d.* to 12·56*d.* The freight statistics for the four



SOUTH EASTERN & CHATHAM RAILWAY.
Chatham-Holborn train near Bickley. 4-4-0 locomotive, No. 213.

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weeks ended November 7, illustrate the serious effects of the coal strike. Coal and coke ton-miles shew a decrease of 69 per cent. Other minerals 19 per cent., and general merchandise 8 per cent. Apart from coal, the principal decreases were in ironstone and iron ore, iron and steel, pig iron and limestone. The large reductions in heavy traffics adversely affected the average wagon load which fell from 5·44 tons to 4·52 tons; the average train load also fell for the same causes from 134·45 to 113·48 tons. The average speed of freight trains increased from 7·62 to 8·38 miles per train hour; but, owing to a large increase in the proportion of shunting hours incurred, the train-miles per total engine hour remained stationary. Considerable progress was made with the construction and repair of rolling-stock; 72 new locomotives and 2,598 wagons were put into traffic during the four weeks, and the number of wagons under and awaiting repair on November 7, was 35,093 or 4·74 per cent. of the total stock as compared with 5.85 per cent. on October 10, representing an additional 8,112 wagons in traffic.

* * *

A NEW geared turbine steamer intended for the Great Eastern Railway, Harwich-Antwerp service, was launched at Messrs. Armstrong, Whitworth & Company's yard at Newcastle-on-Tyne, recently. The christening ceremony was performed by Mrs. John Kenneth Foster, who named the vessel *Malines*. The new boat has a cruiser's stern, and is divided by watertight bulkheads into nine watertight compartments, fitted with Stone Lloyd's mechanically worked watertight doors, operated from the bridge, and controlled by the captain. The vessel will have a Cabine de Luxe on the boat deck, a dining saloon on the upper deck, will be fitted with wireless telegraphy, submarine signalling, and all the modern improvements in respect to lighting and the thermotank system of heating and ventilation. The vessel, which is 337 ft. long over all, 43 ft. broad, will have a speed of 21 knots per hour, and accommodation for over 360 pasengers. A special feature is the number of single berth cabins; the larger part of the remainder being two-berth cabins. She is a sister ship of the turbine steamers *Antwerp* and *Bruges* which were placed on the service last year, and the *Malines* is expected to be completed and ready for the summer service.

THE Rates Advisory Committee of the Ministry of Transport, having completed its inquiry into the general principles which should govern the fixing of railway rates, tolls and charges, a further inquiry is now being undertaken to consider the classification of goods. The Railway Companies have put forward certain proposals, copies of which may be obtained from the Railway Clearing House, Seymour Street, Euston Square, London, N.W.1., price 3*s*. 6*d*. (post free 4*s*.). Traders are invited to submit to the Rates Advisory Committee, objections to the Railway Companies' proposals, or to make alternative proposals on their own account.

* * *

DURING the second week in January Sir Alexander Butterworth gave evidence before the Colwyn Committee, in accordance with the request made by the Committee for information to enable them to arrive at the full facts in connection with the Agreements between the British Government and the railways, and their operation during Government control. Sir Alexander Butterworth, who has been the General Manager of the North Eastern Railway during the last 15 years, was a member of the Railway Executive Committee from the first days of the War, and Chairman of a Sub-Committee of the Executive Committee (known as the Compensation Accounts Committee), which dealt with financial questions arising under the companies' periodical claims against the Government under the agreements, and was closely concerned with financial negotiations with the Government on behalf of the controlled railway companies. In that connection Sir Alexander Butterworth had probably a more active association with such questions than any other member of the Executive Committee, and it was for this reason that he was chosen to carry out the promise given to supply information to the Colwyn Committee. His evidence was directed mainly to his personal knowledge of the history of the agreements made in the early days of the war and subsequent agreements interpreting and amplifying that agreement, and to the relations between the Railway Executive Committee, the Accountants' Committee and the Government Accountants throughout the war and up to the inauguration of the Ministry of Transport

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THE RAILWAY MAGAZINE.

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COMING EVENTS:

March 11th—Mr. Kenneth Brown—Railways-in-law; Grains of Railway History gleaned from Law Reports.

April 8th—Mr. D. H. F. Meacock—Railway Publicity

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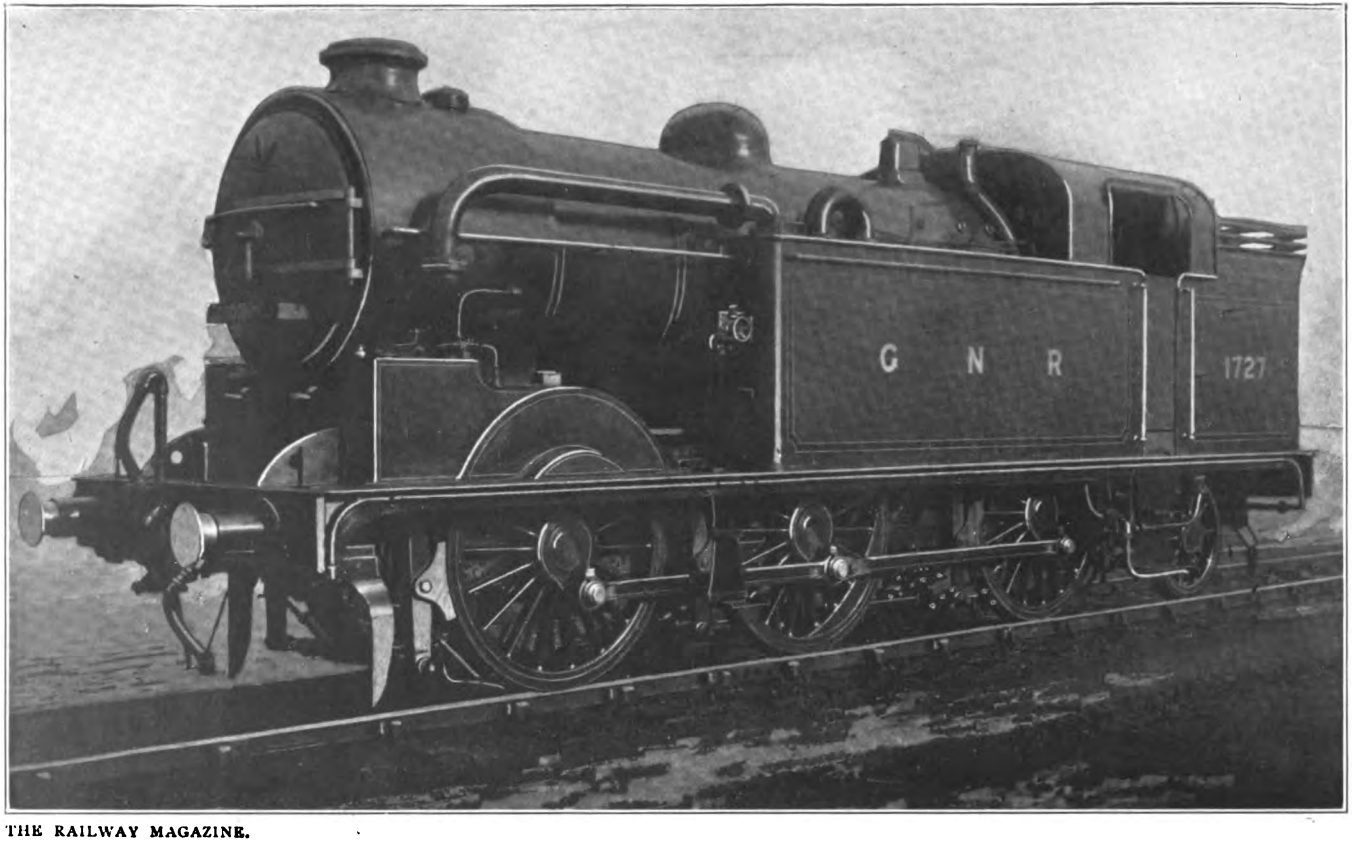

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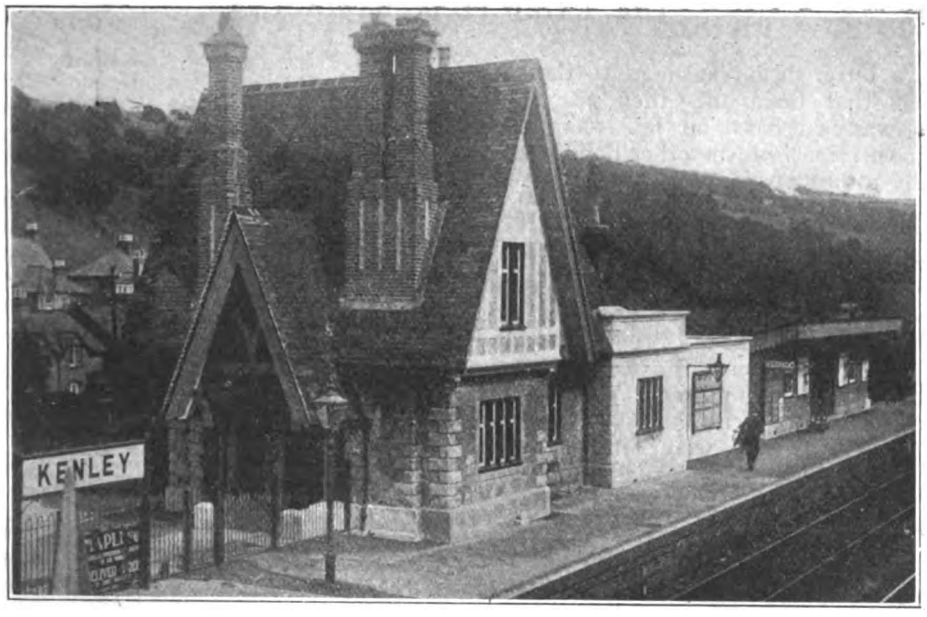

KENLEY STATION (CATERHAM BRANCH).

The Caterham and Chipstead Valley Branches:

SOUTH EASTERN AND CHATHAM RAILWAY.

By H. L. HOPWOOD.

[*Photographs by the Author.*]

PURLEY station, on the main line between London and Brighton, is the starting point of two interesting branches of the South Eastern and Chatham Railway, which lead to Caterham and Tattenham Corner respectively. It is not generally known that the Caterham branch was originally made and worked by an independent company, but such was the case. In the early 'fifties the inhabitants of Caterham projected a line to connect their town (then little more than a village) with the London, Brighton and South Coast Railway at Godstone Road station, 4⅝ miles distant, and in 1853 the "Caterham Railway," as it was known, obtained its Act of Incorporation. Mr. Francis Fuller, of Caterham, was the first chairman.

The railway was opened as a single line from Godstone Road station to Caterham on August 4, 1856, with intermediate stations at Kenley and Warlingham. At the same time Godstone Road station was renamed Caterham Junction, a title which remained unchanged until about 1890, when the present name of Purley was adopted instead. The cost of constructing the Caterham Railway was £39,367, an amount which was some hundreds of pounds within the estimate.

As an independent company the railway had a brief career and an inglorious end. An early report states that efforts were made to induce the Brighton or the South Eastern Railways, or both combined, to work the line on fair and moderate terms, but these failing, the directors had hired plant and were working the line on their own account to great disadvantage. Finally, in July, 1859, the Caterham Railway, which a few years before had cost nearly £40,000, suffered the usual fate of most small systems, *i.e.*, it was sold to its larger neighbour, the South Eastern Railway, for the sum of £15,200. It must have

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been a bitter disappointment to the promoters that their line—then practically new—was sacrificed at less than half the cost price; on the other hand, it was hardly to be expected that a local system of less than five miles, and having only a sparse traffic, could pay its way as an independent concern.

During its period of independence the railway was worked by two engines, said to have been of the "Bury" type, and hired from the South Eastern Railway. That company then possessed a number of Bury engines which had been built in 1842-3, but as they were all withdrawn by 1860, those on loan to the Caterham Railway must have been in a practically worn-out condition when working there.

As a branch of the South Eastern Railway, the line remained in very much its original state until 20 years ago. In 1866 there were eight weekday trains each way, and on Sundays three down and two up, connecting with London trains at the junction. Fares were then cheaper than the "standard" fares of to-day, as the following table shows:—

Caterham and London—

	Single. First-class. s. d.	Second-class. s. d.	Third-class. s. d.
1866	2 8	2 0	1 3
1921	2 11	2 0	1 3

	Return. First-class.	Second-class.	Third. class.
1866	4 0	3 0	2 0
1921	5 0	3 5	2 4

Some years ago it was anticipated the railway would be extended south from Caterham to join the South Eastern Redhill-Tonbridge line at Godstone station—in fact, a "Caterham and Godstone Railway" was formed in 1876 for that purpose—but nothing was done, because the Croydon and Oxted line (which takes a course nearly parallel with the one suggested) was then under consideration and subsequently opened in 1884.

When, twenty years ago, the London Brighton and South Coast Railway carried out the widening between Croydon and Earlswood, Purley station was renewed on an extensive scale. Up to that time it had been of the ordinary roadside type, with a bay on the down side for Caterham branch trains. As rebuilt, there are six through roads, with a corresponding number of platform faces. Of the four platforms, two in the centre are islands; the two easternmost roads are reserved for South Eastern and Chatham branch trains; those in the centre for main line trains of both companies; whilst the westernmost pair accommodate local trains of the Brighton Company. This very up-to-date junction is replete with refresh-

CATERHAM STATION.

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ment rooms, large goods yard, and engine shed. The latter belongs to the South Eastern and Chatham Railway and stables engines which work the branches described.

At the time these alterations were being made, the Caterham branch was doubled throughout and the station accommodation improved. At Kenley the original station had only one platform, but a second one, with new booking office, was added when the line was doubled. The old buildings still remain on the down side and the accompanying illustration of Kenley serves to indicate the picturesque style of architecture originally adopted, both at this place and at Caterham, for the latter station was very similar in appearance before being replaced by the present structure. An additional station was also opened at Whyteleafe, between Kenley and Warlingham; and at Caterham an entirely new station on another site was substituted for the original. All of these improvements date from 1899-1900. The present Caterham station is a fine example of a modern country terminus. It consists of one island platform of considerable length and width, with glazed roof for a great part of the distance. From the platform a covered way leads up to a large booking hall at road level.

The branch line runs through the Caterham Valley and ascends all the way from Purley, first at 1 in 450 and 264 to Kenley, and then at 1 in 100, 110 and 150 to the terminus. The main road from Purley parallels the railway, and rows of modern villas and shops somewhat mar the picturesque surroundings. Kenley is the station for Riddlesdown, a resort on the heights above the valley greatly favoured by day trippers. Caterham town itself has little of interest to show. There are really two towns—the original Caterham-on-the-Hill, and Caterham Valley; the latter being of modern growth and dating from the opening of the railway. It is the surroundings of Caterham, *e.g.*, Harestone Valley, War Coppice and Marden Park—that have made the district famous as a beauty spot. Caterham Valley is 430 ft. above sea level, but the hills around rise to 700 and 800 ft.

TADWORTH AND WALTON-ON-THE-HILL STATION (CHIPSTEAD VALLEY BRANCH).

The Chipstead Valley line, which runs off the Caterham branch 10 chains south of Purley and extends to Tattenham Corner station, a distance of 8¼ miles, is much more modern, and was promoted by two small companies under the auspices of the South Eastern Railway. The Chipstead Valley Company (incorporated in 1892) was responsible for the portion as far as Tadworth, and the Epsom Downs Extension Company (incorporated in 1892),

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Locomotive and Train Working in the latter part of the 19th Century.

THE LONDON & SOUTH WESTERN RAILWAY. [No. VI.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IN the year 1890 the first of a new class of 4-4-0 express engines with outside cylinders made its appearance from Nine Elms Works. The new engines were considerably larger than those of the previous designs, the increase in size being necessitated by the considerable increase in the weight of the trains. There were 20 of them, Nos. 577 to 596, built in 1890–92, with coupled wheels, 7 ft. 1 in. diam.; bogie wheels, 3 ft. 9¾ in. diam.; cylinders, 19 in. by 26 in., and 175 lb. pressure. The heating surface of the tubes was 1,245·6 sq. ft. and of the firebox, 122·16 sq. ft., giving a total of 1367·76 sq. ft., with a grate area of 18 sq. ft. The engines weighed 48¾ tons in working order, of which 30 tons 11 cwt. was carried by the coupled wheels.

The new engines were intended for the heavy expresses between Waterloo and Bournemouth and also for the Exeter expresses between London and Salisbury. The Bournemouth trains were accelerated; the 12.30 p.m. down now ran to Southampton at a speed of 47½ m.p.h., and a 2.15 p.m. down express was put on which ran to Christchurch, 104 miles at 46 m.p.h. This, by the way, was the first 100-mile run of the South Western and was initiated during the 'nineties, though I do not happen to have a note of the exact date.

But the Salisbury runs remained much below those just mentioned in point of merit, and the 11 a.m. from Waterloo ambled down the main line at 43½ m.p.h. for the non-stop run of 83½ miles. The trains were, however, very heavy, and during the summer months would frequently total 250 tons, a big load for those days, when 160 to 200 tons was considered to be well on the top side of the load line. Moreover, the trains carried practically the same number of passengers as they do now, for the luxurious era of the corridor coach had not yet come to pass, since when each main line passenger has to be provided with about one ton of wood and metal-work to convey him about the country.

Those readers who are interested in the details of locomotive performances from an engineering point of view, such as quantity of coal burnt, water evaporated, &c., would do well to consult the Proceedings of the Institution of Civil Engineers, Vol. 125 (1895–6), in which Mr. W. F. Pettigrew, M.Inst.C.E., the late locomotive engineer of the Furness Railway, gave an exceedingly full account* of a series of trials which were made by him with the South Western engines of the 577–596 class between London and Bournemouth and London and Exeter. The following few condensed figures taken from the above source will show the sort of work of which these engines were capable.

The train was the 12.54 p.m. from Exeter to London, and the net load, exclusive of engine, tender, passengers and luggage, was Exeter to Yeovil, 197½ tons; Yeovil to Templecombe, 244½ tons, and from Templecombe to Waterloo, 195¼ tons. The maximum speed attained was 81 m.p.h. when running down a gradient of 1 in 80 between the 148th and 149th mile-posts from Waterloo. The indicated horse-power, taken just afterwards at a speed of 80 m.p.h., was 636·2, the number of revolutions being 316 per minute. The mean speed to Woking, where the trial terminated owing to signal delays, was 44·45 m.p.h., exclusive of stops. The maximum indicated horse-power was 804·3 with a steam cut-off of 48 per cent. on the level when just leaving an up gradient of 1 in 200 at the 115½ mile-post, the speed being 27½ m.p.h. or 109 r.p.m. The coal burnt per train-mile was 32·21 lb.,

* Also published in Mr. Pettigrew's book, "A Manual of Locomotive Engineering" (Griffin & Co.)

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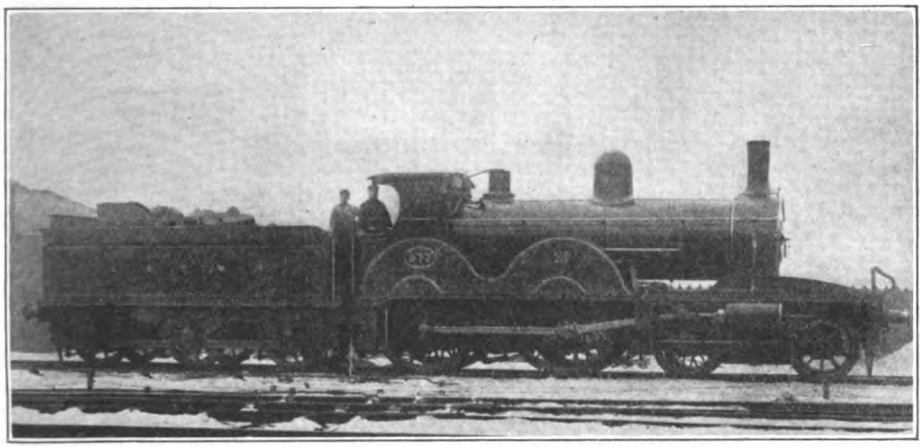
exclusive of lighting up, and 34·81 lb. inclusive of lighting up. The total water evaporated per hour journey time was 10,150 lb., or, taking the running time, 11,600 lb.

As mentioned several times previously, the road between Exeter and Salisbury is very severe, the gradients for a main line being amongst the hardest in the kingdom, and the load, especially between Yeovil and Templecombe, was also heavy.

I called attention to the fact that it was customary for the South Western to employ engines on the section west of Salisbury, having driving wheels generally 6 in. less in diameter than those of the engines used on the more level road at the London end. Consequently, for the Salisbury-Exeter sections Mr. Adams designed the 557 to 576 class, with 6 ft. 7 in. coupled wheels, 3 ft. 7 in. bogie wheels and outside cylinders 19 in. by 26 in. In other respects these engines were not unlike the 577 class, but there was one important difference in that the wheelbase of the coupled wheels was increased from 8 ft. 6 in. to 9 ft. to accommodate a longer firebox. The total heating surface of the 557 class was 1,320·1 sq. ft., of which the firebox supplied 126·4 sq. ft., and the grate area was 19¾ sq. ft. The first three of these engines appeared from Nine Elms Works at the end of 1892, and the remainder followed in 1893.

Twenty more of Mr. Adams's 4-4-0 outside cylinder engines were in hand at Nine Elms when Mr. Drummond took charge, and were completed by the latter. Of these Nos. 677 to 686 were 7 ft. 1 in. coupled, very similar to the 577 class. and Nos. 657 to 666, with 6 ft. 7 in. driving wheels, were of the 557 class. The 677 class differed from the previous 577 class in having longer fireboxes. These larger engines replaced the older 4-4-0 types on the principal expresses, and generally speaking, the 7 ft. coupled engines took charge of the best trains from London to Salisbury and to Bournemouth, and the former 135, 450 and 460 classes were relegated to less important work, such as the Southampton and Weymouth trains.



4-4-0 LOCOMOTIVE No. 577.

Designed by Mr. W. Adams and built at Nine Elms, 1890. Cylinders, 19 in. by 26 in. Coupled wheels, 7 ft. 1 in. diam.

The actual performances of the 577 class were somewhat "streaky." I have a number of runs before me as I write, in which time was distinctly lost, but on the other hand they did very good work on other occasions. No. 685 with 11½ coaches on the up 6.28 p.m. from Salisbury ran to Wimbledon (stop) in 89 min. 35 sec. or 3 min. 25 sec. under time, the running being as follows :—

Salisbury ..	..	dep. 6.41.5	due 6.28.
Andover ..	..	pass 7.4.55	
Basingstoke	..	pass 7.26.35	
Check at Fleet to about 30 m.p.h.			
Woking ..	..	pass 7.52.15	
Wimbledon ..	..	arr. 8.10.40	due 8.1.

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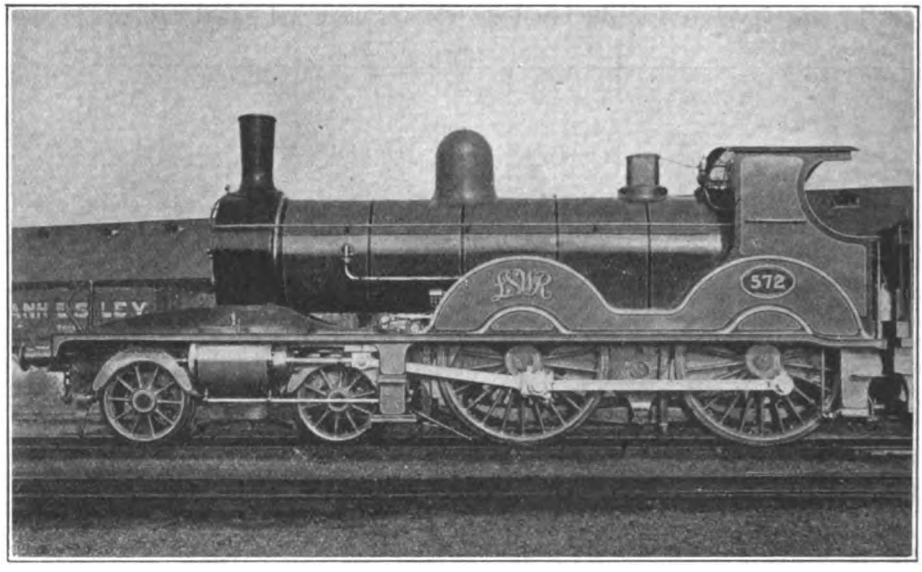
The average speed from start to stop was 51·2 m.p.h. The 40¾ miles from passing Basingstoke to the Wimbledon stop was covered in 44 min. 5 sec., and this included the slack at Fleet.

On a run in May, 1891, on the 12.30 p.m. up express from Salisbury the load was 16 coaches. The engine was No. 577, and one of Mr. W. G. Beattie's 6 ft. 6 in. 2-4-0 engines, No. 296, was attached as pilot engine as far as Basingstoke to help to negotiate the bank up to Grateley. The time allowance from Salisbury to Basingstoke, 35¾ miles, was 46 min., but in spite of the assistance of the pilot engine the train took 47 min. 50 sec. to cover this section. From Basingstoke No. 577 took the train without assistance, and ran thence to Vauxhall 46¾ miles in 10 sec. under the booked time of one hour.

Mr. Rous-Marten recorded a run with No. 593 and 16 coaches from Waterloo to Southampton West on the 12.30 p.m. express. Woking (24½ miles) was passed in 28 min. 2 sec. Basingstoke in 55 min. 29 sec., Winchester (66¾ miles) in 76 min. 13 sec., and Eastleigh (73½ miles) in 82 min. 27 sec. Southampton West was reached in 90 min. 11 sec., the running average being 52·9 m.p.h. and the maximum speed down the descent after Winchester, 73·7 m.p.h. Engine No. 686 ran from Salisbury to Vauxhall with a train of 12 coaches, 82¼ miles in 91 min., a really excellent performance done at the average speed of 54·3 m.p.h.

The 557 to 576 class, with the smaller 6 ft. 7 in. driving wheels, generally appeared to the outside observer to give better performances than the larger-wheeled 577 class. Not only did they seem to run equally as well on the easier eastern section between Waterloo and Salisbury, when they happened to be working expresses over this road, but, according to Mr. Rous-Marten, his experiences showed that they attained higher downhill maximum speeds, and, of course, they were better hill-climbers, as would naturally be expected. They were, however, essentially suited to and used for the heavy roads between Salisbury and Exeter, and Exeter and Plymouth, and did very good work on these sections No. 557, with a load of 230 tons, ran the 49 miles from Exeter to Yeovil Junction in 65 min.



4-4-0 LOCOMOTIVE: No. 572.

Designed by Mr. W. Adams and built at Nine Elms, 1893. Cylinders, 19 in. by 26 in. Coupled wheels, 6 ft. 7 in. diam.

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12 sec. The time allowance it is true, was only 62 min., but with the load this could probably have been accomplished only with the aid of a pilot. Up the 1 in 90 Honiton bank the lowest speed was 25 m.p.h., and speeds of 78·2 and 81·8 m.p.h. were attained on downhill stretches. The 28½ miles from Templecombe to Salisbury, which include banks of 1 in 90, 1 in 100 to 1 in 130, were covered in the excellent time of 34 min. 20 sec. start to stop. No. 558 ran from Yeovil Junction to Exeter, 49 miles, in the excellent time of 59 min. 1 sec., with a load of 180 tons, and No. 564, with the same load from Exeter to Yeovil Junction, in 59 min, 20 sec.

The 8.30 a.m. express from Plymouth, at the end of last century had the fastest booked run on the South Western, viz., Okehampton to Yeoford, 14½ miles in 16 min., or 54·4 m.p.h. running average, and No. 571 on this train, loaded to 125 tons, made the extraordinary timing of 14 min. 14 sec., covering several miles at 80 to 82 m.p.h. On the other hand, like most other classes of engines, they occasionally failed to impress the observer, especially No. 566, which at one time had a dubious reputation in the matter of steam, and would saunter down the line pending developments on the part of its boiler in the direction of producing that somewhat necessary motive fluid.

Of the thirty engines of this class, Nos. 557 to 576 and 657 to 666, a considerable number were stationed at Exeter, and several at Salisbury. There were also one or two at Plymouth and Torrington.

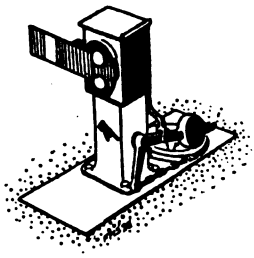
I am indebted to a correspondent in the West of England for some interesting notes on the working of the South Western engines during the Beattie period. The 6 ft. 6 in. coupled engines of the "Atalanta" class, Nos. 163 to 168 and 170 to 175, built in 1859–60, were put to work on the Salisbury–Exeter section, for which road they were designed, and for many years worked in turn with the 6 ft. coupled engines. In 1875 the Exeter engines with 6 ft. 6 in. wheels, were 18, *Albert*; 68, *Apollo*; 71, *Alaric*; 72, *Arrow*, and Nos. 41 and 295 without names. The four 6 ft. engines, Nos. 11, 26, 233 and 114, *Frome*, worked in turn with them. Two other 6 ft. engines, Nos. 232 and 235, by Beyer, Peacock & Co., frequently worked over the Exeter–Plymouth section during the early 80's.

During 1872–3 the fastest down express, the 2.10 p.m. from Waterloo, mentioned on page 247 of Vol. XLVII, was worked from Waterloo to Salisbury by the two engines, Nos. 84 *Styx* (6 ft. 6 in.), and 25, *Reindeer* (6 ft.), which were then stationed at Yeovil. On alternate days these Yeovil engines worked an early morning train up to London and returned with the 2.10 p.m. as far as Salisbury. On the other days they worked in turn between Yeovil and Torrington on the North Devon line, so that these men had daily to cover a very long mileage.

Some of the bogie engines, Nos. 348 to 367, worked on the main line services between Exeter and Salisbury from 1877 until 1883, when they were replaced at Exeter by five of Mr. Adams's 7 ft. coupled engines of the 445 to 456 class. The latter were replaced a year or two later by Mr. Adams's 6 ft. 7 in. coupled bogie engines of the 460 and 470 series.

The Devonport line was worked by all classes of Beattie's engines. One or two of Beattie's 6 ft. 2-4-0 engines, such as *Vulture* No. 30 and *Saturn* No. 89, were at one period stationed at Torrington and worked to Exeter, but generally the North Devon line was worked by Beattie's small tank engines.

(*To be continued.*)



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THE RAILWAY PORTRAIT GALLERY.

Photo.] **MR. FANE VERNON, D.L.,** [*Lafayette.*

Chairman,

Great Northern Railway (Ireland).

ELDEST son of the late John Edward Vernon, who was a director of the Great Southern and Western Railway, a director of the Bank of Ireland and one of the Irish Land Commissioners, Mr. Fane Vernon was born July 5, 1847. Educated at Marlborough College and at Cambridge University he became a director of the Bank of Ireland. In 1890 he was appointed a director of the Great Northern Railway (Ireland), and became Deputy-Chairman in 1905 and Chairman in 1909. Mr. Fane Vernon, like his father before him, and whom he succeeded, is Agent over the Irish estates of the Earl of Pembroke. He is also one of the Dublin directors of the Liverpool, London and Globe Insurance Company, and Deputy-Lieutenant for the County of Cavan.

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Railway Versus Road and Water Transport.

By J. F. GAIRNS.

ADDRESSING the members of the Institute of Transport recently, Lord Montagu of Beaulieu suggested that the British railway companies had missed a great opportunity by not exercising imagination and foreseeing a time when it would pay them to provide "roads without rails" alongside, above or below the railway tracks, for the use of fast motor vehicles, on payment of tolls. He also visualised an era of roads of new types; the abolition of speed limits, at any rate on the open road; and the provision of tracks reserved exclusively for motor traffic.

Obviously the future must include provision for transport on a very much larger and wider scale than the present, and it may be, as Lord Montagu also suggested, that railway companies will eventually be compelled to provide motor roads as well as railway tracks, with equipment for the carriage of passengers and goods, even to the extent of replacement of the "rail"-ways by special "road"-ways. Indeed, it is not impossible that the conceptions of certain "futurist" novelists in regard to transport machinery may be realised, though these are, as a rule, of too superficial a character to call for serious consideration, especially in view of the lack of practical knowledge of what public service transport really involves, so often evidenced.

The "Effect of the Present."

But it does not follow that future conditions will be so markedly different from those of to-day, except in regard to the scale of operations, and that must proceed by gradual evolution and not by leaps and bounds, so that the "effect of the present" must be a continually operating though cumulative factor. It is only reasonable to assume that, however greatly traffic and traffic conditions may increase, revolutionary changes can only apply to a limited extent. Moreover, many of the developments assumed by writers who endeavour to look far ahead require changes of a special character, and which may have little relation to the problems and possibilities discussed, before they can be realised.

For example, it is easy to suggest that railway companies should construct motor roads above, below or alongside their tracks; but we can hardly imagine that Parliamentary powers therefor would be granted without considerable opposition, for the present powers would not be sufficient, while it is inconceivable that open roads will ever be made "speed-free" for travel at really high speeds, seeing that general road users must always retain some of their rights, though speed restrictions may be made more elastic, within reasonable limits. Indeed, the opinion may be expressed that the desire to monopolise rights of user on public roads in favour of motor road transport is likely, in the end, to react most adversely upon the motor industry itself.

Road-Free Motor Traffic.

Under prevailing conditions, and perhaps for a few years to come, this factor may not operate very seriously; but with the great extension of road conveyance, the only remedy will be the construction of motor roads reserved exclusively for such traffic, *and these will have to be paid for*, possibly by the community, but more fairly by the users. Therefore, besides private "ways"—the railways—with their complications of signalling, regulation and organisation, we should have "ways" for road traffic requiring more or less similar methods, as the scale of operation increases, if not at first. In other words, there would be, to use the language of paradox, "railways with rails," and "railways without rails." The latter would develop slowly it is true, but as traffic thereon reached dimensions seriously comparable with the scale upon which main line railway traffic is conducted, signalling, control, regulation, and other

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features would have to be added until there would be a strong resemblance to railway operation, with, of course, the corollary of many charges from which road transport is at present exempt.

This brings us to the main point of this article, that although road transport is a serious competitor with rail transit while the scale is not too large, there are limits to possible development, and when these limits are passed, road transport will also become more and more subject to the special costs incidental to the provision of prepared and private ways, and with increasing volume will come the need for regulation and control, tolls and charges, and the services of special staffs.

If there had been no Railways.

Some years ago the writer contributed to *Chambers' Journal* an article entitled "If there had been no railways," wherein it was suggested that, in default of railway construction, the development of mechanical road transport would have produced conditions and methods not seriously dissimilar from those which now apply in regard to railways, apart from essential differences due to the special features of road as distinct from rail motive power and equipment. There would, of course, have been certain special facilities, some of which will accompany the provision of reserved motor roads, including the ability to transfer to and from the ordinary roads at will. But there would also have been certain decided drawbacks, especially for large-scale transport, in that even with the use of trailers, the engine power and staff per travelling unit would show a much higher ratio to load hauled than under rail conditions. Incidentally, it is inconceivable that actual travelling speeds could be as high as by rail, when dependent upon the steering abilities of individual drivers.

It is, however, unnecessary to consider roads as an alternative to railways as a whole, and the main point now is that it is only while it operates upon a scale which permits of road transport being carried on without regard to the cost of the way on which it runs, each unit being moreover able to travel substantially as it pleases, so that no extraneous staffs and equipment are called for, that it is able to offer approximately effective competition with rail transit. Indeed, it does not follow that when our railways settle down, and trade and commerce find their permanent levels of prices and profits, it will continue to be regarded as economically profitable to carry goods by road in preference to rail.

Special Motor Roads: Who is to pay?

The new motor taxation is stated to be intended to provide contributions to the cost of improving public roads and building new ones capable of carrying heavy motor traffic on a large scale. This is not, however, the same thing as building special motor roads and unless these are paid for by those who benefit, the only alternative is that there must be a general charge upon the public as a whole. In either the principle is introduced of contribution towards the cost of the routes traversed. It is true that the increase of motor road traffic may, for many years to come, realise sufficient to meet essential demands for suitable roads, though it is impossible that present sources of revenue of this character can also meet the cost of special roads reserved exclusively for motor traffic, except, perhaps, in a few isolated instances

But while road traffic is thus developing, the railways will also be overtaking their arrears of maintenance, and the time will come when their goods traffic will be conducted as reliably, expeditiously and, in proportion, as cheaply, as in pre-war days. At present one of the chief claims of road motor transport is that goods pass not only from door to door, but also at times and within periods of transit suited to consignor or consignee. There is, however, no reason why our railways should not again satisfy this requirement: collection to suit consignor, transit on fast and certain schedules (and, if containers are used, without tranship handling), and delivery as desired by the consignee; and at costs which, while necessarily increased, as in the case of the prices of the goods handled, will compare favourably with those of road transport when fairly estimated.

The Correct Computation of Road Motor Costs.

Emphasis may be laid upon this last point, for there are wide differences of opinion as to how road transport costs

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should be arrived at. Allowing that under present conditions motor road transport is less costly, even when every possible factor is taken into account, than rail transit, when all that involves is also considered, much must depend upon the scale of operations, and it is impossible to interpret isolated individual experiences as providing unassailable data. The chief factor of motor road competition as it affects the railways is, indeed, that it tends to abstract the more highly rated and more valuable traffic, leaving to the railways that of a heavier and less profitable nature. To some extent this is inevitable, though before very long a degree of equalisation is certain to result. Against this, however, is the growing tendency to insist upon larger or collective consignments by rail, and of consignment "by rule and regulation," in order to secure economy of operation, instead of the pre-war practice of suiting customers' convenience as well as requirements to a very large degree.

Load-Tare Rates by Road and Rail.

In any event, it is only by raising the ratio of load to tare in the case of railway vehicles, and of utilising engine power more efficiently, that the railways can continue to carry goods at little more than 100 per cent. over pre-war rates, as compared with general trade increases of very much higher percentages. On the other hand, though unrestricted competition may cause the cost of goods conveyance by road in the hands of contracting carrying agencies to remain within profitable limits, and private firms may even continue to regard transit by their own vehicles as good policy, there are strong indications that the issue will before long become a very doubtful one.

Passenger conveyance by road may be largely developed; but its economics, in so far as serious competition with rail transit are concerned, are somewhat dubious. In the case of goods traffic the ultimate issue is even more doubtful. Both may be good business in particular cases, especially while no additional burdens are placed upon motor traffic in consideration of the special privileges it enjoys as compared with transport agencies which have to provide and maintain special and private rights of way. But as already indicated the corollary to continued development is the provision of special tracks and other responsibilities, which, however valuable they may be in themselves, will also figure on the cost side of the account.

Water Transit and "Right of Way" Charges.

So far road and rail transit only have been considered, and the position is somewhat different in regard to water transit. Both rail and river involve various dues tolls and charges, which is not the case with road transit, while special loading and unloading equipment is generally called for. Canals are analogous to railways in that they also constitute prepared and private rights of way, which have to be constructed, maintained and staffed by the proprietors, and these costs have to be covered as well as those of actual conveyance, and the provision of vessels. By sea, river or canal, too, possible journeys are restricted to the water routes available, and it is not practicable to pass through high ground except by expensive flights of locks or tunnels. Speed by canal is also necessarily slow, so that the chief competition they exercise with railways is the conveyance of bulk loads of more lowly-rated goods, where rapid transit is not required. Sea and river competition is more serious in that conveyance is in bulk and can be reasonably rapid; but unless both starting point and destination are on the coast or on waterways, transhipment to or from railway wagons, lighters or barges is necessary, and the cost of transport correspondingly increased.

Coastal Water Traffic and Transhipment.

There was, in pre-war days, and will be again in due course, a large coastal coal traffic, and where modern coal shipping appliances are fitted, the fact that transhipment from rail to ship at one end of the journey is involved was not a seriously deterrent factor, while elevators and other adjuncts similarly facilitated transhipment to railway wagons or lighters for the final stage of transit. But for traffic not thus favourably situated water competition was not a very serious factor except in particular cases. For traffic of this class, road transport is almost entirely out of the question.

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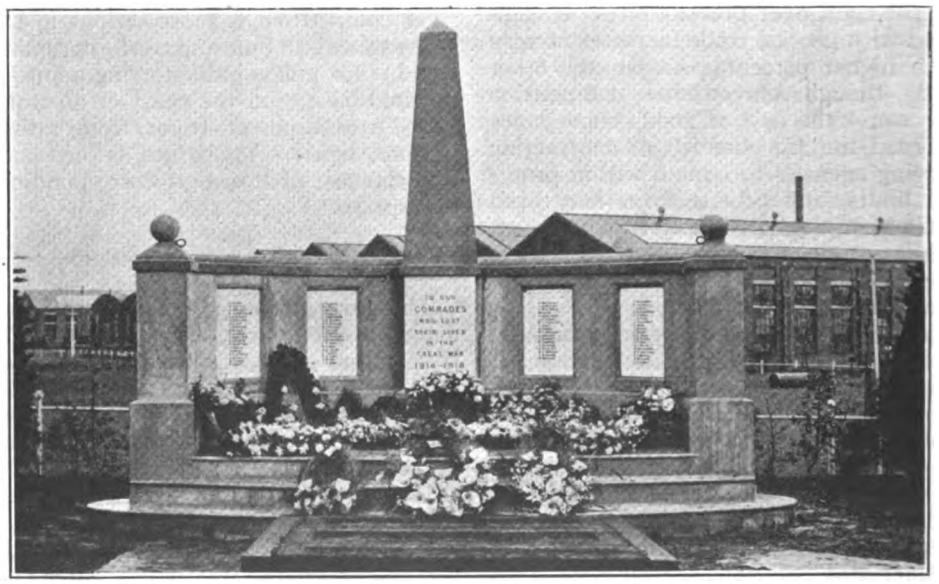
The Transport Situation in the Future.

In the net result the writer is strongly of opinion that the near future is not likely to witness any drastic alteration in the transport situation. Water transport will continue to carry very much the same share of traffic as in pre-war days, and as they find their new economic levels, the coastal, river and canal transport agencies will be restored to operating soundness in so far as they can continue to justify themselves. Adjustment of rates will, of course, be essential, in the case of those which are still bound by the old statutory enactments; but charges which have reached unreasonably high levels will have to come down again. Road transport, while it will be considerably increased, cannot develop to any great extent without becoming subject to special charges which will tend to restore the economic level. As for the railways, they will remain the great transport agencies, operating more efficiently in some respects, and insisting that trade and commerce shall pass more in accordance with traffic methods which are economically sound than was always the case in the past. Some branch lines may possibly be closed and dismantled, and replaced by road motor services, while it is hardly likely that many new ones will be built where regular road facilities will suffice. Where, however, there is a steady traffic, though on a smaller scale, light railways will, in many cases, be preferable to road services.

But before an effective correlation and co-ordination of all public transport agencies can be realised, competition between them must provide remedies for their problems. By development, each will show its own possibilities, and thus prepare the way for the evolution of the transport system of the future.

WAR MEMORIAL: CARRIAGE AND WAGON DEPARTMENT, LONDON, BRIGHTON & SOUTH COAST RAILWAY.



MEMORIAL ERECTED AT THE LANCING CARRIAGE AND WAGON WORKS FOR "COMRADES WHO LOST THEIR LIVES IN THE GREAT WAR, 1914-1918."

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst. T.

Photo.] [*F. H. Stingemore.*

GREAT WESTERN RAILWAY.

Goods Train near Perranporth. 4-4-0 "Duke" class locomotive, No. 3277, "Isle of Tresco."
(Note the fixed distant signal protecting sharp curve.)

UNDER the caption, "Speed of Trains," there recently appeared in the *Daily Telegraph* a particularly well-written and aptly-phrased leading article, inspired by the acceleration of the "Southern Belle" expresses on the London, Brighton and South Coast Railway to their pre-war time of 60 minutes between Victoria and Brighton, which is well worth quoting:—

"At a season when we expect to hear that train services are to be worse rather than better comes the welcome announcement that the journey to Brighton is once more to be made in the hour. So one British company has at last been able to work up its expresses to a speed which was reckoned high in 1914. The distance to Brighton is, of course, only just over fifty miles, but the conditions are such that to cover the distance, start to stop, in sixty minutes requires good locomotive work. This is not, indeed, the only instance of recovery of something like the old efficiency. Several companies last summer were able to work to time-tables which, without being a replica of those of the old days, showed a number of important services not conspicuously inferior. A difference of a few minutes on a considerable journey is not important to the traveller. But when the minutes extend to, let us say, half-an-hour on a two hours' run, the loss of time is serious and irritating. Everyone knows that over a great part of the country the speed of expresses is still so much slower than before the war as to interfere with the conduct of affairs. If an hour or more is added to travelling time no one can transact as much business as of old by a journey to this town or that. The original hour's delay by the slowness of the train becomes multiplied many times by the wastage of extra journeys or of remaining overnight away from head-quarters. We are aware that the railway companies have still great difficulties to contend with, and difficulties which are unequal in their incidence. Some lines have suffered more than others from the strain of war, and improvements which are immediately practicable in one case must still be deferred in another. High speed is very far more costly than of old, for it means working engines hard, with an increased bill for repairs and a lavish consumption of coal; and, from the rail-

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way manager's point of view, as one of them has said, 'Coal is no joke now.' But, without demanding pre-war schedules, we venture to say that a good deal more might be done to cut down travelling time. The public want speed, not from any idle desire to be carried at so many miles per hour. In fact, hardly one man in a train knows or cares what the speed is at any moment, and often the sensation of speed is given when the actual running is slow enough. The need is for schedules which will give the traveller as much time as possible for his own affairs. The railway companies may well concentrate attention on a portion of their services. On those journeys which require only a few hours, leaving the greater part of the day for business, even a small saving of time is valuable. Speed therefore is not a luxury, but a necessity—the raw material of efficiency in trade and affairs."

The *Daily Telegraph* is noted for the temperate character of its criticisms, and it would hardly be possible to present the case with more scrupulous fairness than is done in the article quoted. A closer study of the current time-tables, however, might have added considerable weight to the writer's strictures. He would have noticed that, although "some lines have suffered more than others from the strain of war, and improvements which are immediately practicable in one case must still be deferred in another," disparity in speed is by no means found only as between one company and another. It was doubtless the important London-Birmingham services that the writer of the article had in mind when he mentioned the "serious and irritating" loss of time occasioned by the extension of a two-hours' run to one of two-and-a-half hours. This means an increase in journey time of 25 per cent., and yet an analysis of the time-tables of the Great Western Railway—one of the two companies providing the services referred to—reveals the fact that the average time from London to the other principal towns on the Great Western system is now well under 10 per cent. in excess of the pre-war figure. As recently mentioned in these columns, the neighbouring town of Worcester, though 10 miles further from Paddington than Birmingham in point of distance, is actually 15 minutes nearer in point of the best travelling time, and this disparity could hardly be attributed to the superior importance of the former. This is but one example of many which might be cited to prove that "a good deal more might be done to cut down travelling time."

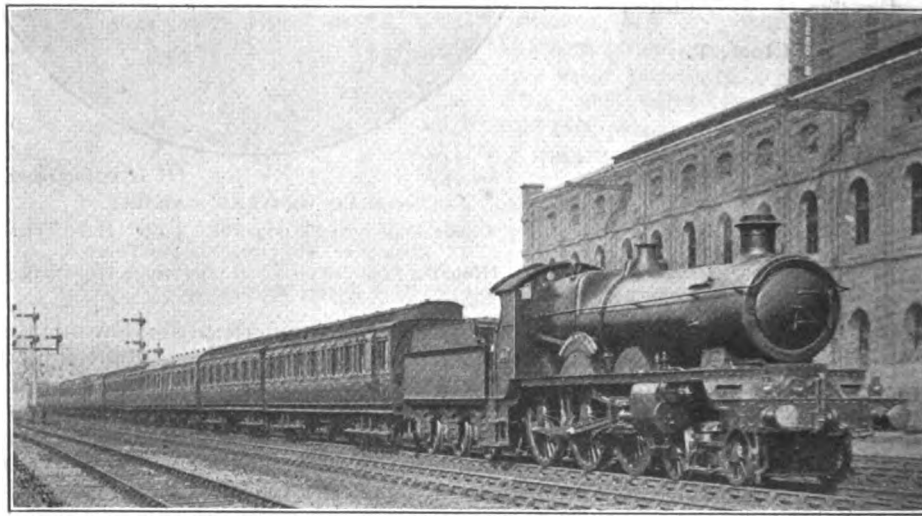

Photo.] GREAT WESTERN RAILWAY. [*F. E. Mackay.*

Up Cheltenham breakfast car express. 4-cylinder 4-6-0 locomotive, No. 4034, "Queen Adelaide."

In an issue of a weekly contemporary published last August, there appeared an article entitled "Post-War Time-Table

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Reconstruction—Small Improvements in Former Competitive Rail Services," which had a great deal to say on the question of anomalies in present travelling times, similar to the case referred to in the last paragraph. The bulk of this article was designed to prove, by the aid of a carefully-compiled table, that, in the reconstruction of main-line time-tables subsequent to the war, express services between London and important towns served by competitive routes had not improved in nearly the same degree as those to and from towns served monopolistically. Taking as its basis the fastest times operating from London to 40 of the principal British cities and towns, in the summer time-tables of 1920, the table made it clear that, whereas the monopolistic services had improved in journey time to within 6·69 per cent. of the times in force in 1914, the competitive services were still 13·56 per cent. behind their pre-war figures. Instances were given in which trains falling within both these categories passed over the same routes for portions of their journeys, the competitive trains being scheduled at considerably lower speeds than those serving non-competitive points only; other cases were detailed in which competitive trains appeared to "spill" time over portions of their journeys, in order that the end-to-end travelling times might not fall below certain minimum figures agreed between the competing companies.

Seven months have now elapsed since this article appeared, and, so far from there having been any levelling up of the speed of the competitive to that of the non-competitive services, the tendency in subsequent time-table alterations has been markedly in the other direction. The only improvements in the fastest competitive times from London during this period to the towns figuring in the table have been the curtailment by the Midland Company by 6 min. of the best time from London to Sheffield, and by 1 min. of that to Nottingham; against this must be set a deceleration of 17 min. by the same railway of the minimum time to Bradford. On the other hand, as regards monopolistic or virtually monopolistic services, further accelerations have been made in fastest times from London to the extent of 12 min. to York (Great Northern Railway), 10 min. to Liverpool and 9 min. to Chester (London and North Western Railway), 5 min. to Bristol (Great Western Railway), and 5 min. to Brighton and 8 min. to Eastbourne (London, Brighton and South Coast Railway). The only decelerations to non-competitive places have been 6 min.

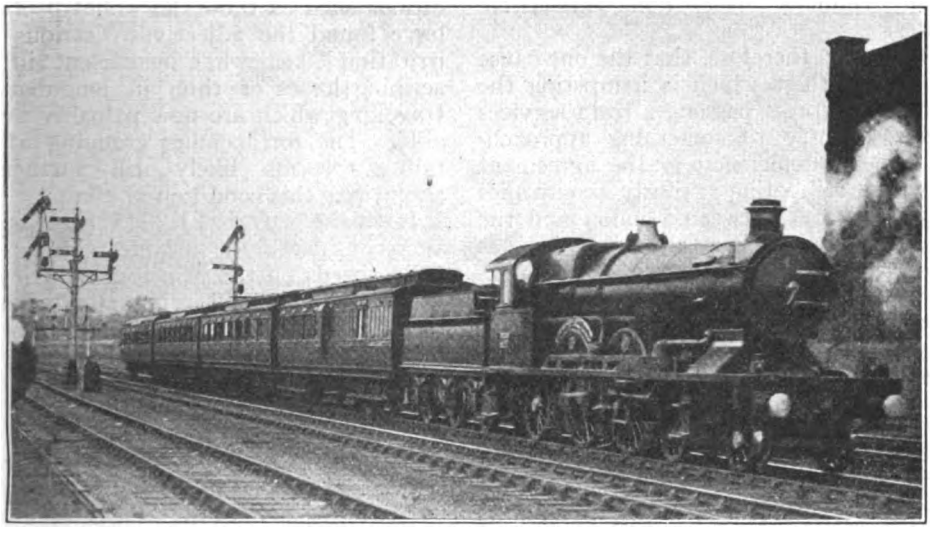

Photo.] GREAT WESTERN RAILWAY. [*F. E. Machay.*

Up Cheltenham and Gloucester express. French 4-4-2 compound locomotive, No. 103, "President," as rebuilt at Swindon.

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to Newcastle (Great Northern and North Eastern Railways) and 5 min. to Cambridge (Great Eastern Railway). So far as the towns included in the table of the August article are concerned, therefore, since that date non-competitive services have further improved from within 6·69 per cent. to within 5·56 per cent. of their pre-war average figures, whereas the competitive services, which had improved to within 13·56 per cent., have declined again to 13·68 per cent. below pre-war. That is to say, there is now an inferiority of no less than 147 per cent. in the post-war improvement of competitive long-distance services, as compared with those running over non-competitive routes.

It is clear, therefore, that the one cause above all others which is hampering the return of express passenger train services in this country to something approaching pre-war efficiency is the agreement between competing railway companies that the times between London and the chief provincial cities shall not be cut below certain agreed figures—an arrangement to which, doubtless, the Ministry of Transport is also a party. In this connection it is noteworthy that the particular train service acceleration which furnished the writer of the leading article in the *Daily Telegraph* with his "text" was on a monopolistic route—between London and Brighton—over which a timing of sixty minutes, as he rightly points out, requires "good locomotive work." And yet we have, at the other end of the scale, the vastly important business services between London and Birmingham, Liverpool and Manchester still from 25·0 per cent. to 28·6 per cent. behind their pre-war times.

In a recent article of this series I described in detail a run on the 11.5 a.m. London and North Western express from Euston to Manchester, the notable feature of which was that, had the pre-war number and duration of stops been combined with an absence of delays by signals and other causes, the locomotive work was such that the journey would have been completed in 3¾ hours instead of the 4½ hours allowed. Inclusive of all delays and of waiting "time" at intermediate stations, the overall schedule time was curtailed by 8½ min.

Again, only a week or two ago, on the 10 a.m. West Coast express from Glasgow to London, we ran into Carlisle 3 min. early, Crewe 5 min. early, Northampton 4½ min. early (this was only prevented from being 8 min. by frequent brake applications after Althorp Park !), and passed Willesden 4 min. early, waiting a correspondingly increased time at each stop. Allowing for the moderate downhill running, scarcely exceeding 64 m.p.h. on the most favourable stretches, we could have cut the schedule by 40 min., arriving at 6.30 instead of 7.10 p.m., without the remotest difficulty. Had the writer of the leading article in the *Daily Telegraph* been aware of the existence of circumstances and conditions such as these, he would probably have found the adjectives "serious and irritating" somewhat insufficient in describing losses of time in long-distance travelling which are now palpably avoidable. The forthcoming grouping of the railways seems likely still further to accentuate this condition of affairs.

It might surprise the average reader very considerably if he were told that the train speeds on the principal British railways to-day are inferior in many directions to those which obtained in 1888. A study in this connection of Foxwell's "Express Trains, English and Foreign," published in 1889, provides food for serious reflection. On the Great Northern Railway there were, in 1888, 14 daily express trains between London and Leeds, taking an average of 4 hrs. 15 min. on the journey; to-day, 12 trains only take an average of 4 hrs. 25 min. The best of the 1888 expresses occupied 3 hrs. 50 min. on the journey; the best in 1921 takes 20 min. longer. On the Midland Railway in 1888 12 expresses daily between St. Pancras and Manchester averaged 4 hrs. 25 min. in overall time; to-day, 15 expresses average 4 hrs. 45 min., and the *fastest* time—4½ hrs.—is 5 min. more than the *average* time in 1888. The present best non-stop time of 145 min. to Nottingham was then performed with the addition of a 4-min. intermediate stop at Kettering; Leicester could be reached in 115 min., instead of the present fastest time of 120 min., and Leeds in 8 min. under the 1921 "best" of 4¼ hrs. If we turn to the London and North Western Railway, we find that 12 express trains between Euston and Manchester maintained an average time daily of 4 hrs. 17 min. in 1888; to-day the 12 fastest

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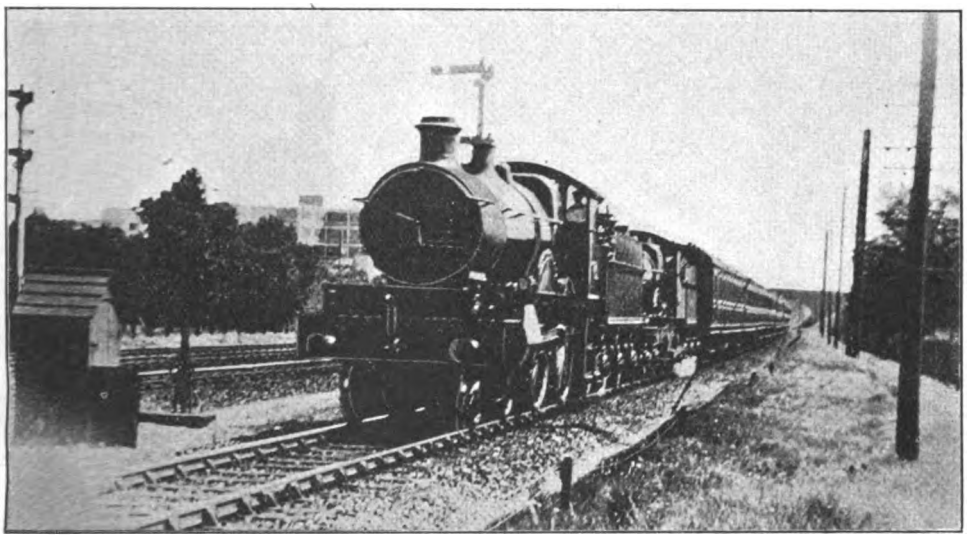
trains average in time 4 hrs. 44 min., and the "best" time of 4½ hrs. in 1921 is 13 min. over the average time of 1888. These are random examples, and it is an extraordinary thing that, after 33 years of unexampled progress in the development of the tractive power and efficiency of the steam locomotive—a development which has far outstripped the increase in train loads during the same period—we should be in a worse position as regards railway speed in 1921 than the last generation was in 1888, even after making all "war" allowances.

If the maximum speed records which have been achieved during this same period were considered, some still more astounding contrasts might be made. In the "Race to Edinburgh" of 1888, the East Coast companies worked their 10 a.m. train on August 31 from King's Cross to Edinburgh in 7 hrs. 26¾ min., with 5 stops aggregating in duration 38 min., that is to say, in 6 hrs. 48¾ min. actual running time. To-day the same express is allowed 9 hrs., or, after deducting the time of four stops, 8 hrs. 28 min., an increase of 24 per cent. in 33 years of supposed progress. In the still more exciting "Race to Aberdeen," of 1895, the 393 miles to Edinburgh were run by the 8 p.m. express from King's Cross on August 21 in 6 hrs. 18 min., the actual running time being 369½ min. (this was equivalent to a throughout average speed of 63·7 m.p.h.); and Aberdeen, 523½ miles from London, was reached in 8 hrs. 40 min., the inclusive speed for the whole distance having been over 60 m.p.h., despite five stops, three bad checks, and a stretch of single line north of Arbroath, on which frequent slacks required to be made in order to change the single-line tablets. Twenty-six years later, in 1921, the same train requires 12 hrs. 50 min. for its journey to Aberdeen—an increase of no less than 48 per cent. in time! The next night—August 22—the West Coast companies ran their 8 p.m. Aberdeen express from Euston in 8 min. less, having covered their longer distance of 540 miles, including three stops and the negotiation of the summits at Shap and Beattock, of 914 ft. and 1,015 ft. altitude respectively, in 512 min., at an average end-to-end speed of 63·3 miles per hour. To-day the best West Coast service from London to Aberdeen takes 11¼ hrs.



GREAT WESTERN RAILWAY.

Paddington-Weymouth train near Hayes. 4-4-0 locomotives, No. 3412, "John G. Griffiths" (train), and No. 3801, "County Carlow" (pilot).

If such times as these could be achieved by the express locomotives of 26 and 33 years ago, many of which have by now reached the scrap-heap, what might not be done by the vastly more powerful

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and efficient locomotive giants of the present day? The trains involved in these racing records were, of course, mere featherweights in the matter of load, and those performing the ordinary time-table journeys of 1888, to which reference has been made, were far lighter than the standard express train of to-day, but, with all allowance for increased loads, there is no question that the speed capacity of the modern locomotive both could be, and should be, used to a much greater degree than it is at present in the service of the travelling public.

A few recent experiences on the Great Western Railway, timed both by myself and by correspondents, will serve to show how, even on the most enterprising of all British railways in regard to post-war time-table reconstruction, many of the present times appear considerably more generous than present circumstances warrant. I have first a trip on the 12 noon train from London to Exeter, allowed 195 min. for the 173·9 miles via Westbury; our load was nine 70-ft. 8-wheelers and a 12-wheeled "diner," weighing 342 tons empty and 365 tons full, and the engine was a 4-cylinder 4-6-0, No. 4010, *Western Star*. Getting away well we passed Southall, 9·1 miles, in 13 min. 5 sec., at 60 m.p.h., and Slough, 18·5 miles, in 21 min. 50 sec., at 69; but after passing Burnham Beeches, 21 miles, in 24 min. 5 sec., we were all but stopped by signals at Taplow, and experienced bad signal checks from there on to Reading, whereby we took 45 min. 50 sec. to cover the initial 36 miles. The checks had cost us rather over 8 min., and our net time to Reading was about 37½ min. The usual fine work ensued from Reading up to Savernake, the 17·1 miles to Newbury (including the slow running over the Reading junctions) taking 19½ min., and the 17 miles thence to Savernake 18 min. 40 sec., with a minimum of 47½ m.p.h. on the last 3 miles at 1 in 180–144. The descent to Westbury was taken more easily than circumstances warranted, speed at no time exceeding 72½ m.p.h.,; the 25·5 miles from Savernake occupied 23 min. 40 sec., and made a total of 107 min. 40 sec., or a little under 99½ min. net, for the 95·6 miles from London. Slacking severely through both Westbury and Frome, we completed the 5·7 miles between these points in 8¼ min., and then went rather poorly up to mile-post 122¾, the 7·2 miles from Frome taking 10 min. 25 sec. From the summit down to Castle

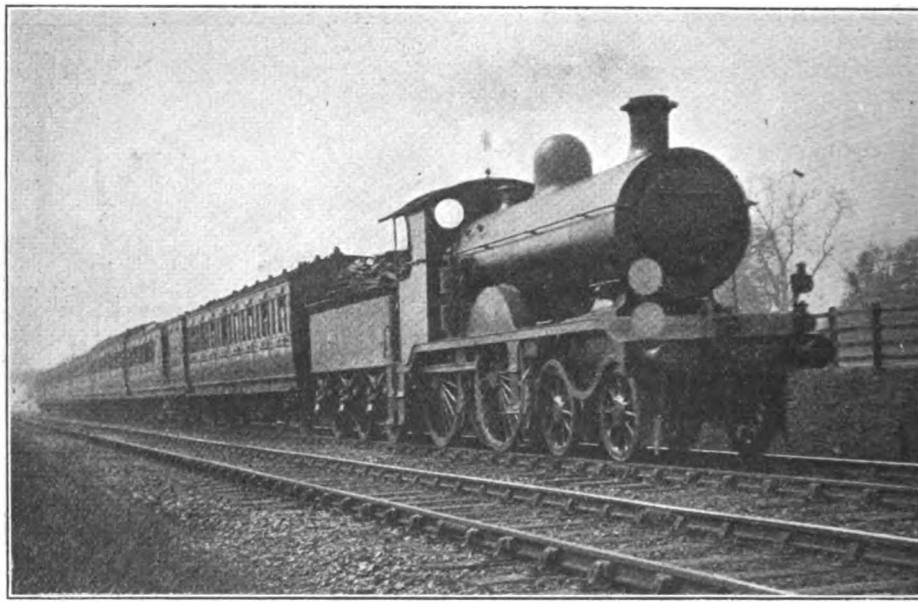

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*F. W. Curtis.*

London–Brighton train *via* Horsham. Rebuilt 4-4-0 locomotive, No. 322.

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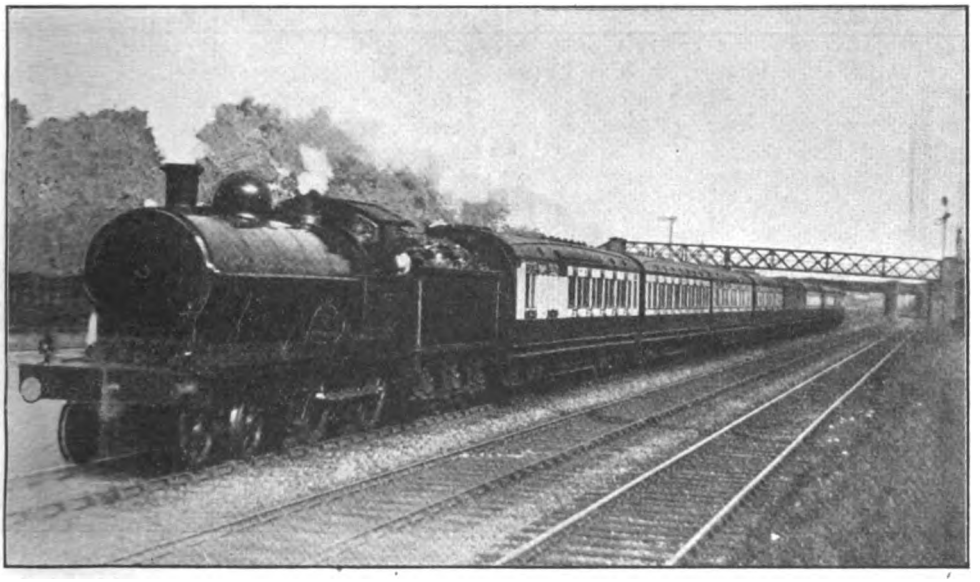
Cary, the 6·8 miles were run in 6 min. 25 sec., with a top speed of 74 m.p.h., and the 22.6 miles thence to Cogload Junction were covered in 21 min. 35 sec., with maxima of 69 m.p.h. at Somerton and 75 at Curry Rivell. Taunton, 142·9 miles, was passed in 159 min. 50 sec., or 151½ min. net. The 10·9 miles up to Whiteball summit were taken very easily, as they occupied no less than 17 min. 5 sec., and speed fell to 24·5 m.p.h. Indifferent speed ensued, also, on the descent to Exeter, the last 19·9 miles taking 20 min. 55 sec.; the total time from London was, therefore, 197 min. 50 sec. Although 3 min. had been regained from Reading, it is a pity that the driver had not enough enterprise to pick up the other three, as he easily could have done; as it was, our net time to Exeter was about 189½ min.—5½ min. under schedule.

On the interesting stretch of line west of Exeter, I have some trips requiring mention. Four-cylinder 4-6-0 No. 4022, *King William*, with a ten-coach train weighing 320 tons, passed Dawlish, 12·2 miles in 17¼ min., and after making the prescribed slack for the new tunnelling works near Teignmouth, reached Newton Abbot, 20·2 miles, in 30 min. 10 sec.—a poor performance, as the timing of 28 min. includes an allowance for the slack. But from there we did much better with a reduced load of 270 tons. Attaining just 40 m.p.h. on the undulating 1¼ miles from the fresh start, we breasted the terrific climb to Dainton (of which the last 1¾ miles average 1 in 50, and the last ½ mile at 1 in 43) at a minimum rate of 13·8 m.p.h., passing Dainton Box, 3·8 miles, in 9¾ min., and Totnes, 8·6 miles, in 15 min. 40 sec. Next comes Rattery Bank, with a mile averaging 1 in 68 up, 1⅝ at 1 in 50, and 1½ at 1 in 85 average, in succession, not to mention a further 4¼ miles to Wrangaton mostly and fairly steeply uphill; passing Totnes at 57½ m.p.h., we fell to 17·4 m.p.h. on the 1 in 50, but recovered to 28 on the 1 in 85. So we covered the 4·6 miles from Totnes to Rattery Box (at the top of the 1 in 85) in 9 min. 40 sec., the 2·3 miles thence to Brent in 3¾ min., and the 2·2 miles on to Wrangaton in 3 min. 5 sec.—total, 17·7 miles of appalling grades from Newton Abbot in 32 min. 10 sec. From there the 7·4 miles to Hemerdon were run in 8 min., and Plympton, 27·8 miles, was passed in 42 min. 50 sec., but signal delays made the total time for the 31·8 miles to North Road



LONDON & NORTH WESTERN RAILWAY.

Up Express near Kenton. 4-4-0 locomotive, No. 1363, "Brindley" superheated "Precursor" Class.

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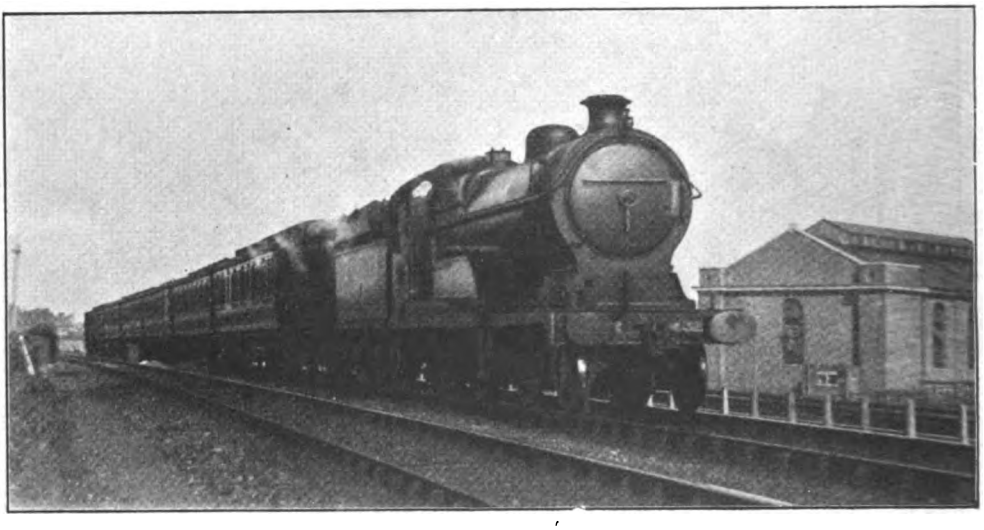
Plymouth, 53 min. Net time, however, was not more than 49 min., against 52 min. allowed.

I made two runs in the reverse direction with similar loads, and 4-cylinder 4-6-0's on both occasions, No. 4060, *Princess Eugenie*, having a 245-ton train, and No. 4035, *Queen Charlotte*, one of 255 tons—seven 70-footers and eight mixed bogies respectively. The actual start from North Road to Mutley is rising at 1 in 86 for ⅜-mile, but from there a sharp fall of 1¼ miles follows to Lipson Junction. On the first run the getting-away was spoiled by a bad permanent way check at the latter junction, followed by a very severe bridge slack at Tavistock Junction, and we took 10 min. for the first 4 miles to Plympton; on the second, unchecked but running very easily down to Lipson and not exceeding 55 m.p.h., we took 6 min. 50 sec. Hemerdon Bank, with its full 2¼ miles at the staggering grade of 1 in 40–42, begins almost immediately; on the first run, after accelerating from a walking pace at Tavistock Junction to 42½ m.p.h. in 1¼ miles partly uphill, we fell to 18·6 m.p.h., covering the 2·7 miles from Plympton to Hemerdon in 6 min. 50 sec.; but on the second, through slipping, we fell to 10·3 m.p.h., and took exactly 1 min. more. With the exception of 3 miles made up of short strips of level or falling grades, the 7·4 miles from Hemerdon to Wrangaton are on rising grades, mostly of from 1 in 100 to 200 steepness, but we covered them in 9½ min. and 10 min. 10 sec. respectively; from there we took 5 min. 20 sec. and 5 min. to Rattery, 4·5 miles, and 7 min. 20 sec. and 5 min. 5 sec. on to Totnes, 4·6 miles, the downhill speeds being most restrained, with the additional hindrance in the former case of a bad p.w.r. check before Totnes. From Totnes the 4·8 miles up to Dainton—almost entirely rising, and concluding with 1⅛ at 1 in 57–43–40–41—took 7 min. 50 sec. and 10 sec., with minima of 18·8 m.p.h., and 18·4 m.p.h.; while the remaining 3·8 miles down to Newton Abbot were run with great caution in 6 min. and 6 min. 5 sec.—total, 52 min. 50 sec. (or 46 min. net) and 48 min. 10 sec. from North Road. Schedule in both cases was 48 min. Loads were increased to 320 and 325 tons at Newton, and inclusive of the Dawlish tunnel slack, for which again allowance is made in the working time of 28 min., we took 27½ min. and 26 min. 50 sec. for the 20·2 miles on to Exeter.



GREAT CENTRAL RAILWAY.

Nottingham–Marylebone train near Harrow. 4-4-0 locomotive, No. 432, "Sir Edward Fraser."

From Exeter the first of the two trains was one running *via* Westbury—the summer express due in London at 7 p.m.—and calling at Taunton; with our load of

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320 tons unchanged, we covered the 19·9 miles up to Whiteball in 26 min. 10 sec., falling to 36½ m.p.h. on the concluding 2¼ miles at 1 in 115; then touching 77½ m.p.h. on Wellington Bank, we reached Taunton in 36 min. 40 sec., 38 min. being allowed for the 30·8 miles. From there to London the train was so well on time that, with an allowance of 165 min. and this moderate load, the performance—according to Great Western standards, at any rate—was quite uninteresting. We passed Cogload Junction, 5 miles, in 7 min. 40 sec., and ran the 22·6 miles of the "new" line to Castle Cary briskly in 23 min. 25 sec.; on the ascent to "122¾" the minimum rate was 33 m.p.h., and with moderate speed on the far side, not exceeding 67 m.p.h., and the usual slacks at Frome and Westbury, the passing times from Taunton to the three points mentioned—34·4, 41·6 and 47·3 miles respectively—were 39½ min., 47 min. 40 sec., and 55 min. (allowed 56 min.). The 25·5 miles from Westbury up to Savernake occupied 31 min. 10 sec., with minima of 44 m.p.h. on the 5¾ miles at 1 in 222 to Patney, and 46 on the concluding 2½ miles at 1 in 240–153 to the summit; after this we ran most gently down to Reading, the 17 miles to Newbury taking 17 min. 40 sec., and the 17·1 miles on to Reading 18¾ min., with the usual slack through the junctions at the latter place. From Reading to Slough the 17·5 miles occupied 19 min. 5 sec., with a top speed of 67 m.p.h., and we should comfortably have kept schedule time, having run the 132 miles from Taunton to Hayes in 148½ min., but for concluding signal delays.

The second run from Exeter was in the Bristol direction, not stopping at Taunton, and was a very poor show, the time to Whiteball with 325 tons being 28 min. 50 sec., and to Taunton 38 min. 5 sec., despite a maximum of 77½ m.p.h. on Wellington Bank; after that the running was so deliberately eased that we took no less than 35 min. 50 sec. for the 32·8 dead level miles on to Yatton. Time-keeping was now impossible, and so we took 86 min. 35 sec., or 1½ min. in excess of the easy allowance, for the 75·6 miles from Exeter to Bristol. In comparison a run over the same course of which a friend sends details was a most sporting affair. Two-cylinder 4-6-0 No. 2934, *Butleigh Court*, was the engine, with a gross load of 245 tons; the start from Exeter was 25 min. late. First of all the 19·9 miles to Whiteball were run in the excellent time of 23½ min., although including 12 miles steeper than 1 in 350 and 8 steeper than 1 in 225; minimum speed on the 1 in 115 was 48 m.p.h. There was no higher rate than 70 m.p.h. on the descent to Taunton, which was passed in 33½ min., and succeeded by a long p.w.r. check costing at least 3 min. But Bridgewater, 42·4 miles, was passed in 47 min. 10 sec., at 67 m.p.h., and the succeeding 21·2 level miles to Yatton were reeled off in 18¼ min., at an average of 69·7 m.p.h.—a splendid feat. Then, most unfortunately, there came a signal slack—practically a dead stand—beyond Yatton, with the result that the total time to Bristol was 82½ min., but the net time could not possibly have been more than 75½ min. for the 75·6 miles, start-to-stop, and was probably even less. As it was, 5½ min. were gained on a schedule of 88 min., but the net gain was 12 min. or 13 min.!

In the opposite direction, over the same route, another correspondent sends details of a fine run behind 4-cylinder 4-6-0 No. 4020, *Knight Commander*, with a lighter train of 200 tons, on which time was kept despite one p.w.r. and two signal checks on the earlier part of the journey, at Yatton, Puxton and Dunball respectively. Because of these, though Nailsea, 8·1 miles, had been passed in 11 min. 5 sec. from the start, and the 6·7 miles from Bleadon to Highbridge, between checks, were run in 6 min. 40 sec., it took in all 41¾ min. to get through Bridgwater, 33·2 miles. But from there the 11·6 miles to Taunton, including 1½ up at 1 in 255, were covered in 10 min. 25 sec.—the average rate from Bridgwater to Durston was 69·6 m.p.h.—and the 10·9 miles thence up to Whiteball took 12¼ min. The last-mentioned was a splendid feat, and I am only sorry that the record gives no details of the minimum speed. No effort was spared to regain time after the summit, the whole 19·9 miles to the stop at Exeter taking only 18¼ min.; from Collumpton to Stoke Canon speed averaged 72 m.p.h. for 9·1 miles. Total time for the 75·6 miles from Bristol was thus 82 min. 40 sec., instead of the 85 min. allowed, but here again, on the basis of the work performed

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out to Nailsea and beyond Bridgwater, the net time was probably less, rather than more, than "even," *i.e.* 75½ min.

My own trip forward from Bristol to London, on the 5 p.m. express—now accelerated to a 130-min. run, inclusive of the slack for the platform line at Reading, which is worth at least 3 min.—was behind 4-cylinder 4-6-0 No. 4017, *Knight of Liège*, with a full train of seven 70-ft. "eights," or 237 tons tare and 255 tons gross. The start was moderate, as it took us 12 min. 10 sec. to get through Filton Junction, 4·8 miles, with a minimum of 23 m.p.h. up the 2 miles at 1 in 75, and 18 min. to Coalpit Heath, 9·1 miles; but then followed a characteristic piece of Great Western running, as, having attained the mile-a-minute rate up a 1 in 300 grade, we *averaged* 61·2 m.p.h. up 1 in 300 continuously with 255 tons for 8½ miles, to Badminton. Thus this first 17·6 miles took 26 min. 20 sec. Rapid acceleration brought us up to 76½ m.p.h., but equally rapid "easing" dropped the speed to 64 even before we had passed Hullavington, and thereafter for a long distance the run had little interest. We passed Wootton Bassett, 34·7 miles, in 43 min. 50 sec.; Swindon, 40·3 miles, in 51 min. 20 sec. (extraordinarily sluggish running between these two points); and Steventon, 61·1 miles, in 72 min., at 64½ m.p.h. I live in hopes that at some date prior to the Millennium I may enjoy an up journey over this route without being checked at Didcot; as yet such is denied me, and we got signals on, to a walking pace, at Foxhall, Moreton Cutting and Cholsey, so that the 11·8 miles from Steventon to Goring took 19 min. 50 sec. With a maximum of 68 m.p.h. at Tilehurst, and a very long slack before Reading, prior to slipping a coach in the platform road, we passed the centre of Reading Station, at 30 m.p.h., 81·6 miles, in 101 min. 20 sec. Although it was now impossible to keep time, our driver, with his reduced load of 220 tons, determined to do his best to regain what he could, and on the practically level track thence to London some startling running ensued. In 5 miles to Twyford we recovered from 30 to 65 m.p.h.; at Maidenhead we were doing 71½, at Taplow 72½, at Slough no less than 76½ (my *record* here), falling from there to 74 at Langley, 71½ at West Drayton, 68 at Southall, and gradually to 60 at Old Oak. So we ran from Reading to Twyford in 6½ min., from there to Maidenhead, 6·8 miles, in 6 min.;

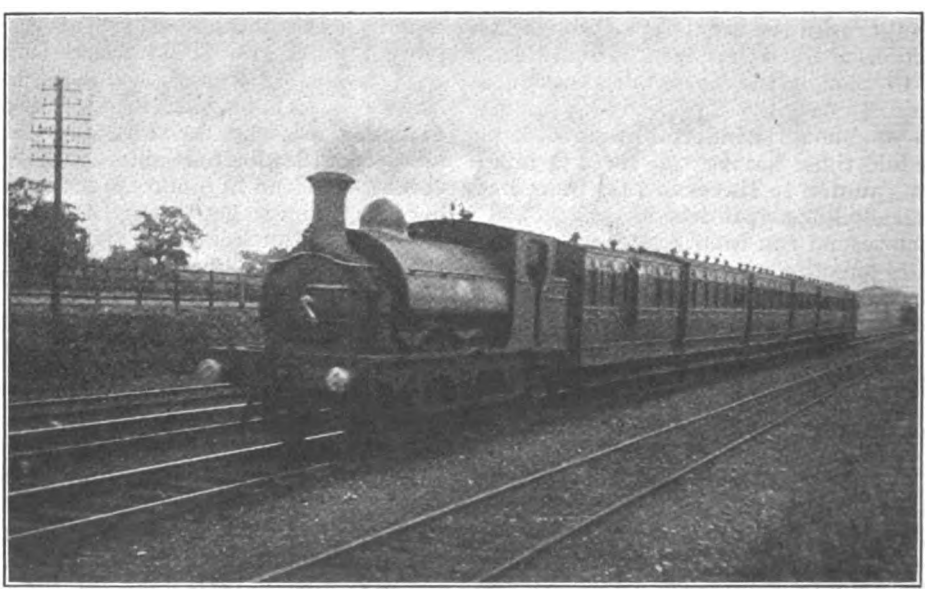

Photo.] RHYMNEY RAILWAY. [*K. A. C. R. Nunn.*

Cardiff-Merthyr train near Heath. 0-6-2 saddle tank engine, No. 64.

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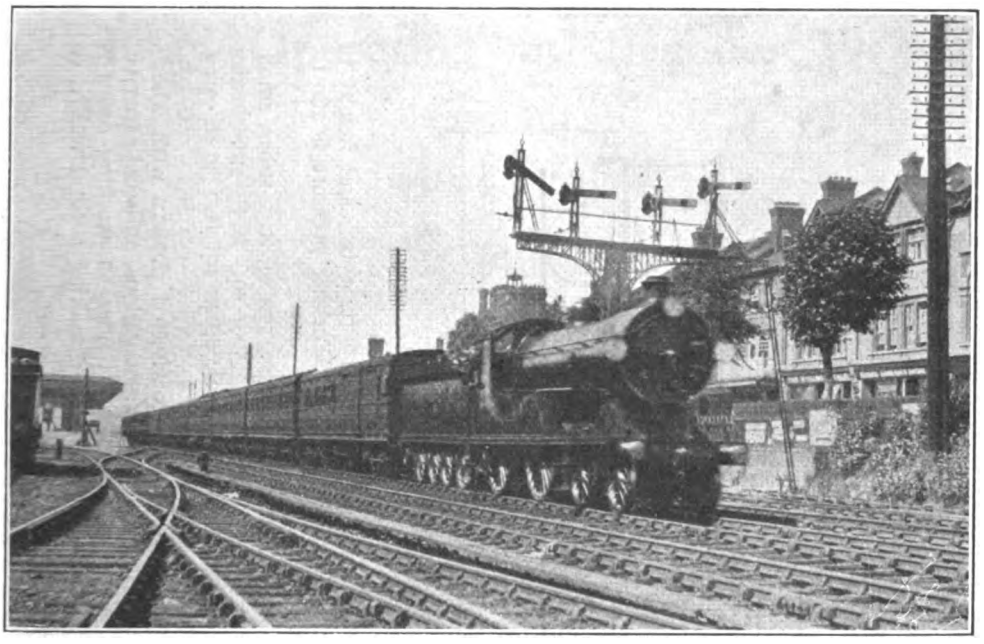

Photo.] [*E. J. Housego.*

LONDON & SOUTH WESTERN RAILWAY.

Up Plymouth Express passing Woking. 4-4-0 locomotive No. 470.

Maidenhead to Slough, 5·7 miles, in 4 min. 45 sec.; Slough to West Drayton, 5·3 miles, in 4 min. 20 sec.; on to Southall, 4·1 miles, in 3 min. 35 sec., and thence to Old Oak West, 5·8 miles, in 5 min. 20 sec. —total, 27·7 miles from Twyford in 24 min. exactly, at an average of 69·3 m.p.h. Cautious running into the terminus made the last 3·3 miles take 5 min. 35 sec., but even so we had run in from Reading in 35 min. 50 sec., or over 4 min. less than schedule. From Bristol our total time was 137 min. 10 sec. for the 117·6 miles, and the net time about 127 min., although this time could obviously have been cut by handfuls between Badminton and Reading, on the basis of the running at the western and eastern extremes of the journey.

With much more Great Western material on hand, I must nevertheless, through lack of space, content myself for the present with details of another remarkable "sprint," timed by a correspondent on the 11 a.m. express out of Paddington during the course of last summer. Two-cylinder 4-6-0 No. 2944, *Highnam Court*, was the engine, with a load described as "nine corridors"—probably all 70-ft. cars, on the average formation of that train, and weighing in all about 315–320 tons. With this load Ealing, 5·7 miles, was passed in 8 min. 28 sec.; West Drayton, 13·2 miles, in 15 min. 7 sec.; Slough, 18·5 miles, in 19 min. 33 sec.; Twyford, 31 miles, in 29 min. 38 sec.; and Reading in 35 min. 10 sec., after a very slow approach. Speed had, therefore, averaged 71·4 m.p.h. from Ealing to Twyford, and all but 75 from Slough to Twyford! Not content with this, the driver passed Newbury, 53·1 miles, in 53 min. 30 sec.; Savernake, 70·1 miles, in 70 min. 39 sec.—averaging a mile-a-minute up all this ascent—and Westbury, 95·6 miles, after a p.w. check, in 97¼ min. From here the letter says he "dawdled, being so early," and no wonder! For such astounding achievements Mr. Churchward's incomparable six-coupled locomotives and their drivers surely have a reputation all their own! But why cannot the time-tables give them more encouragement?

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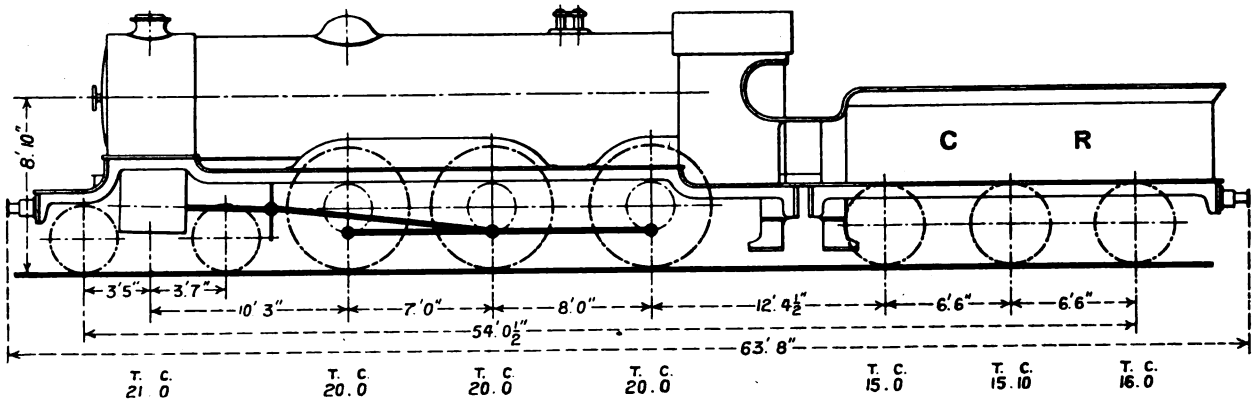
NEW THREE-CYLINDER EXPRESS LOCOMOTIVE, CALEDONIAN RAILWAY.



WE are indebted to Mr. W. Pickersgill, C.B.E., Chief Mechanical Engineer, Caledonian Railway, for a diagram and particulars of a new three-cylinder 4-6-0 locomotive, belonging to a series now under construction of heavy main line traffic.

The three cylinders have a diameter of 18½ in. and a stroke of 26 in. The outside cylinders drive the middle pair of coupled wheels and the inside one the crank axle of the leading pair. Coupled wheels are 6 ft. 1 in. diam., and the bogie wheels 3 ft. 6 in. diam. The boiler is of large proportions, having a mean diameter of barrel of 5 ft. 9 in., length of barrel, 16 ft. 3 in., and height of centre from rail, 8 ft. 10 in. Working pressure is 180 lb. per sq. in.

Heating surfaces are: firebox, 170 sq. ft.; tubes, small, 1,700 sq. ft.; tubes, large, 500 sq. ft.; superheater elements, 270 sq. ft.; total, 2,640 sq. ft.; grate area, 28 sq. ft.

The tender is of the six-wheeled pattern with wheels 4 ft. diam., tank capacity 4,500 gallons, and coal capacity, 5½ tons. The weight of the tender in working order is 48 tons, thus, with the engine, making a total weight of 129 tons.

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Railway Operating in France, 1915-18.

[No. II.]

By M. C. ROBSON.

BEFORE passing on to deal with the period from March 22 to August, 1918, when the writer returned to England wounded, some description will be attempted of the way in which the time-tables were prepared and the trains worked.

Nearly everybody who has been in France has complained of the appalling time taken over a short journey. While not attempting to contradict this, the following remarks may afford a reasonable explanation.

A first principle was laid down in France on the outbreak of war that all trains running in the war zone should travel at a uniform speed—one train following another at a fixed interval. It, therefore, followed that the speed at which the trains were to be timed must be the speed of the slowest, and, speaking roughly, 33 kilometres per hour was agreed upon. Tables were accordingly prepared and a programme of six trains per hour was fixed (*i.e.*, ten-minute intervals). Each "path" was termed a *marche*, and these *marches* were all numbered. In addition, each area of the Northern line had a letter to distinguish the *marche*. This very much facilitated the work, and was undoubtedly a very sound method.

Troop movements were always run at a maximum density of one train per hour, and the *marches* for troop trains were specially distinguished. Such *marches* could not be used for ordinary trains when troop movements were taking place.

The only variations from this system were the passenger trains and the through Paris coal trains, which were timed faster and, consequently, upset various *marches* in the course of their journey.

The writer is of opinion that these variations were actually productive of more delays than any other cause, as in practice the accommodation at junction points was so limited that more trains were put on the line than could possibly run to time, when the effect of the "broken" *marches* was taken into account. When troops were moved from one area to another the principle adopted was to load up at three neighbouring stations and unload at three other neighbouring points. This permitted of one train leaving each loading point every three hours, if working at the maximum pressure of 24 trains in 24 hours. Generally the density of such a movement was at the rate of 18 trains in 24 hours. A movement by rail of a Division necessitated some 46 trains, and was designated by the French as a *Courant*. Each *Courant* was numbered, and all people concerned were advised.

The R.O.D. were given official information by the British railway transport service and also by the Nord Railway people. Sometimes we heard of the move first and sometimes the French, but whoever had the first advice at once communicated with the other technical partner. Up to March, 1918, the Frenchmen always provided the guards for these trains when working over French-controlled lines.

The Ligny Control office staff up to March, 1918, consisted of a subaltern in charge, one N.C.O. head controller, and one N.C.O. or Sapper assistant controller, on three turns of duty, eight hours each.

Immediately on the outbreak of the German offensive in March, 1918, the whole operating system was upset. Achiet-le-Grand station was shelled to ruins on the opening day, and through operating via Arras was impossible, while, within a week, the whole group of British lines in the Meaulte area was evacuated. This evacuation of a large group of railways in the face of a rapidly-advancing enemy was conducted with rare skill by Captain Rostern, the R.O.D. officer in command of the detachment, and, so far as standard-gauge rolling-stock was concerned, nothing was abandoned to the enemy except two trains of ammunition, which were left behind near Plateau railhead at the request

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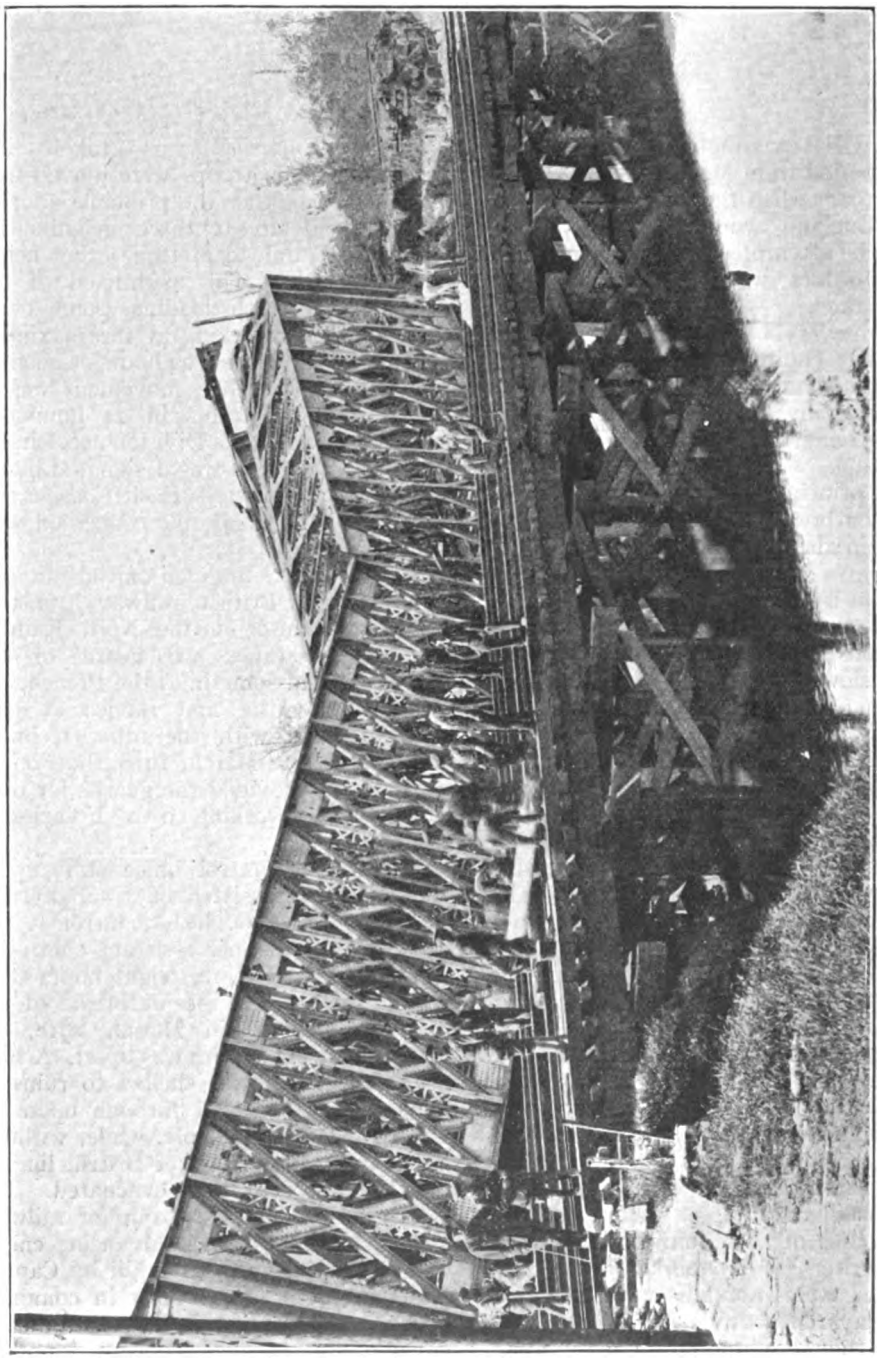

DOUBLE TRACK PILE BRIDGE ON DEVIATION OVER SOMME CANAL, COMPLETED AFTER DESTRUCTION OF ORIGINAL BRIDGE BY THE ENEMY, CHAULNES-PERONNE LINE.

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of the Fifth Army Staff for the use of our own men retreating. These wagons, of course, were not recovered.

All the stores, &c., at the large locomotive depôt at Meaulte were loaded up, and the detachment retired *en bloc* to Blargies, being subsequently sent to Outreau (near Boulogne) and Hesdin.

The cutting of the main lateral railway at Achiet meant a return to the conditions prior to June, 1917. The Ligny-Arras line became once more a *cul de sac*, and, consequently, the north to south traffic was forced on to the St. Pol-Doullens-Canaples-Amiens line, or else to the St. Pol-Montreuil-Abbeville route, and some trains had to be diverted right back to the coast line via Dunkirk-Calais-Outreau and Etaples to Abbeville.

The whole French personnel was withdrawn from the Ligny-Arras line beyond Ligny, except the stationmasters, who remained as representatives of the Nord Company, and looked after any commercial traffic that passed, and the R.O.D. took complete charge of this section.

As all main-line working had to be diverted to the already congested back area lines, delays increased, and all kinds of new engine workings came into operation. The French called on the R.O.D. to continue the working of British trains over the Nord main lines, to which they had to be diverted, and were frequently unable to provide "pilotmen" to help the British drivers, who had in many instances never worked over these lines at all! The men responded magnificently to the call made on them, and in no case did a British driver feel himself unable to carry on with a train over a strange line, and it speaks volumes for their courage and ability that not a single mishap occurred during this very trying period.

The R.O.D. also took over from the French the working of many more main-line trains emanating from base ports and back area dumps, and in several instances provided goods guards as well.

The gradients between St. Pol and Doullens were very much steeper than on the Ligny-Arras-Longueau route, and the large Great Central 2-8-0 type engines and the eight-coupled locomotives from other English companies were unable to haul a train between those points unassisted. This meant that the R.O.D. had to provide a service of bank engines working continuously between St. Pol and Doullens, over a line entirely controlled by the Nord, and one which was carrying a greater density of traffic than ever before. To maintain this "banking" service was a very costly matter, as can be understood when it is realised that the time-table allowance for the run was two hours in each direction.

A similar situation arose south of Doullens, and was dealt with by the R.O.D., Gombremetz detachment, which had moved its headquarters back to Doullens, assistance being provided also by the Candas detachment.

Ligny Control office being adjacent to St. Pol, which had become a still more important centre, had to be reorganised and additional telephone facilities provided. The staff was increased, and on each turn of duty were five men, employed as under:—

N.C.O.—Head controller,
N.C.O.—Assistant controller, dealing with the working on the Ligny-Arras line,
Telephone operator and assistant to head controller,
N.C.O.—Foreman of goods guards, also dealing with enginemen from other R.O.D. depôts,
Orderly,

with either the writer or a subaltern in constant attendance.

St. Pol station became the key-point of the whole operating system in First and Third Army areas, and its limited accommodation was quite incapable of dealing with the increased volume of traffic in a satisfactory manner.

During this period quite 80 per cent. of the trains passing this junction were hauled by R.O.D. engines, and it was at once seen that it would be necessary to have R.O.D. men stationed on the station to keep in touch with the enginemen and pass on the controllers' instructions to the French staff. A train reporter's cabin had long been established at the east end of the yard, and a second telephone cabin was provided at the west end, with train reporters always on duty, and three locomotive sergeants were appointed to work the 24 hours through. This proved a very satisfactory measure, and met with the cordial approval of the French railway authorities, who, of course, gained considerably through the use they were

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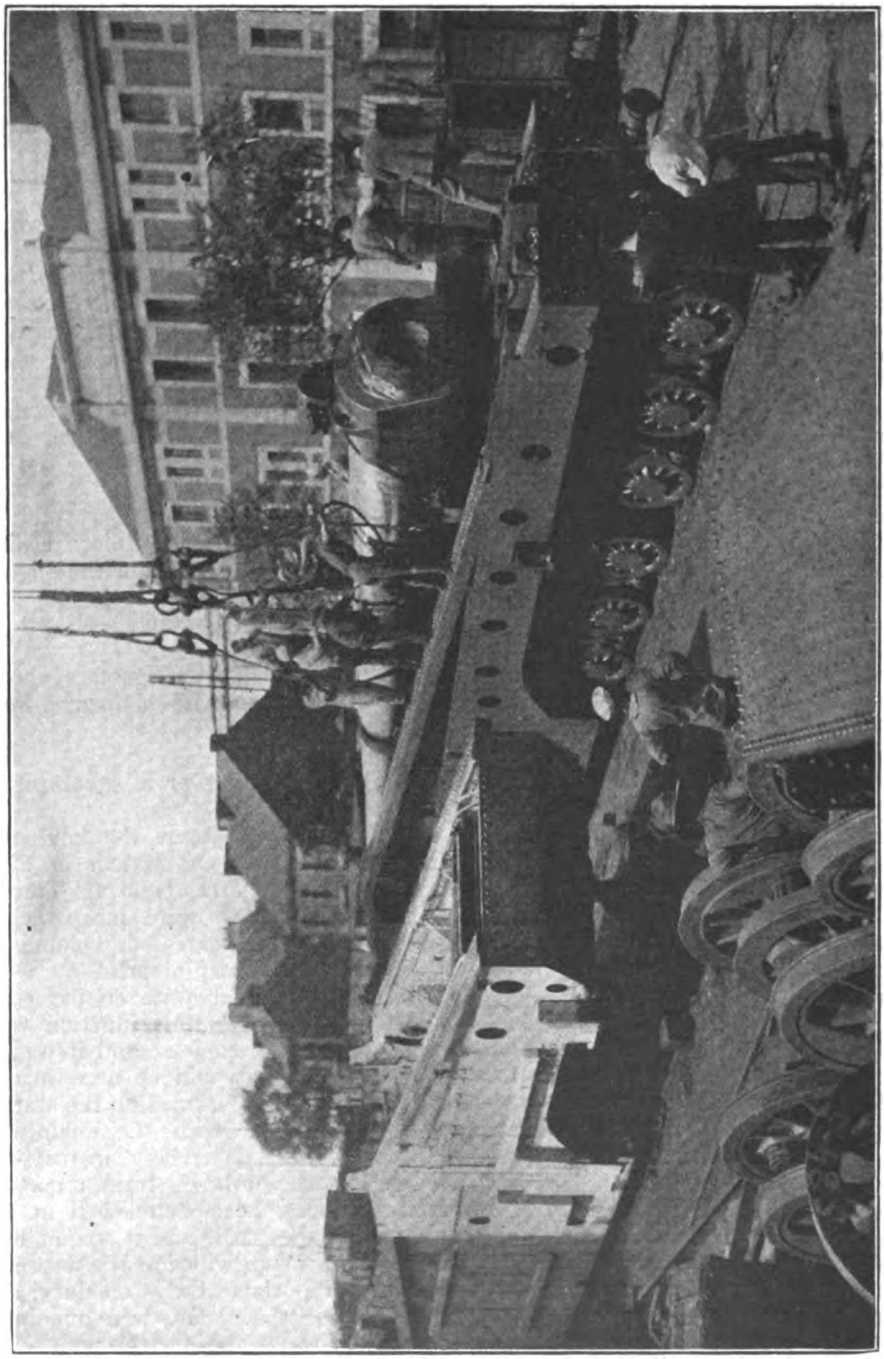

14 IN. GUN BEING LOADED FOR TRANSPORTATION TO THE FRONT.

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able to make of the very superior R.O.D. telephone service.

Frequent night-bombing attacks caused serious dislocation of traffic working, which reacted on the following morning's trains, and matters were often not straightened out until the following evening, when the same performance was probably repeated. At times it was only through extraordinary efforts on the part of the Railway Construction Companies that the traffic was kept moving. To have the work at a railway centre like St. Pol brought to a standstill often twice in a night meant that 24 hours' working had to be done in 18, and when the number of trains passing that point is taken into account this meant a very considerable operating problem.

During the German advance the activity of the German airmen enabled the enemy to keep a very good watch on all movements going on behind the British lines, and our G.H.Q. staff devised several schemes for baulking this constant observation or rendering the enemy's information ineffective.

To mention one scheme, in which the writer was much concerned, a set of tanks was perpetually moved about from point to point, entrained and detrained, and then, after about two days' interval, entrained again and worked off to some other point, where the same performance was repeated, thus deceiving the enemy that preparations were going on at several points for a large tank offensive.

The worst effect of the retreat upon the working was that engines were sent further afield, and met with such heavy delays on the Nord main line that the position for power, and the question of accommodation for the enginemen, who required rest away from their own depôt, became acute. To meet the new conditions the head controller was relieved of the local working, and spent all his time in dealing with main line working, the main part being spent in conference with the French locomotive supervisor at the Nord St. Pol depôt. Many engines from other R.O.D. depôts began to arrive at Tachincourt for rest for the men, and coal, &c. In order to relieve Tachincourt of this influx, and also in view of the frequent bombing of St. Pol at night, these engines were dealt with at Ligny, after being coaled at Tachincourt, and the enginemen were lodged in the camp there. Every effort was made to find "foreign" enginemen (*i.e.*, men from other R.O.D. depôts) a return train to their home stations, and if this could not be done the engines were sent as near as possible so that their return to their own depot could be easily arranged. Great rivalry in the friendliest spirit grew up between the three head controllers as as to who could get the best results. No officer could wish for a more hard-working and intelligent staff than the men at Ligny in 1918.

In order to keep a clear and visible record of where our own engines went to, a board was provided close to the head controller, with the names of the various other depôts arranged vertically and spaces horizontally, where tickets could be inserted showing particulars of the engines away.

To enable some watch to be kept on the movements of R.O.D. engines while working over the Nord main lines, train reporters were stationed at certain junctions and other points with direct telephone communication to the nearest R.O.D. control offices. These men proved of considerable value, as, owing to the congested state of the traffic, no accurate estimate could be formed of when a train would arrive at the R.O.D. exchange point.

The Scarpe Valley section at this period was practically entirely given over to the heavy artillery, who had many large guns on railway mountings in gun spurs all across the Vimy Ridge. No retirement took place in this section—the pivot on which the retirement in the Third and Fifth Army areas took place being Arras —but the R.O.D. had to be prepared to clear the forward sections at any moment. To meet this situation four engines were kept at Maroeuil and three at Aubigny, always in readiness. Actually there was never any occasion to withdraw any of the guns from their positions.

The German attack on the Merville sector still further handicapped the transportation services, as the main line from Hazebrouck to St. Pol was frequently cut by shells in the vicinity of Lillers, and the final enemy attack in the Second Army area compelled the R.O.D. detachment at Borre to retire to Arques and rendered the working of traffic through

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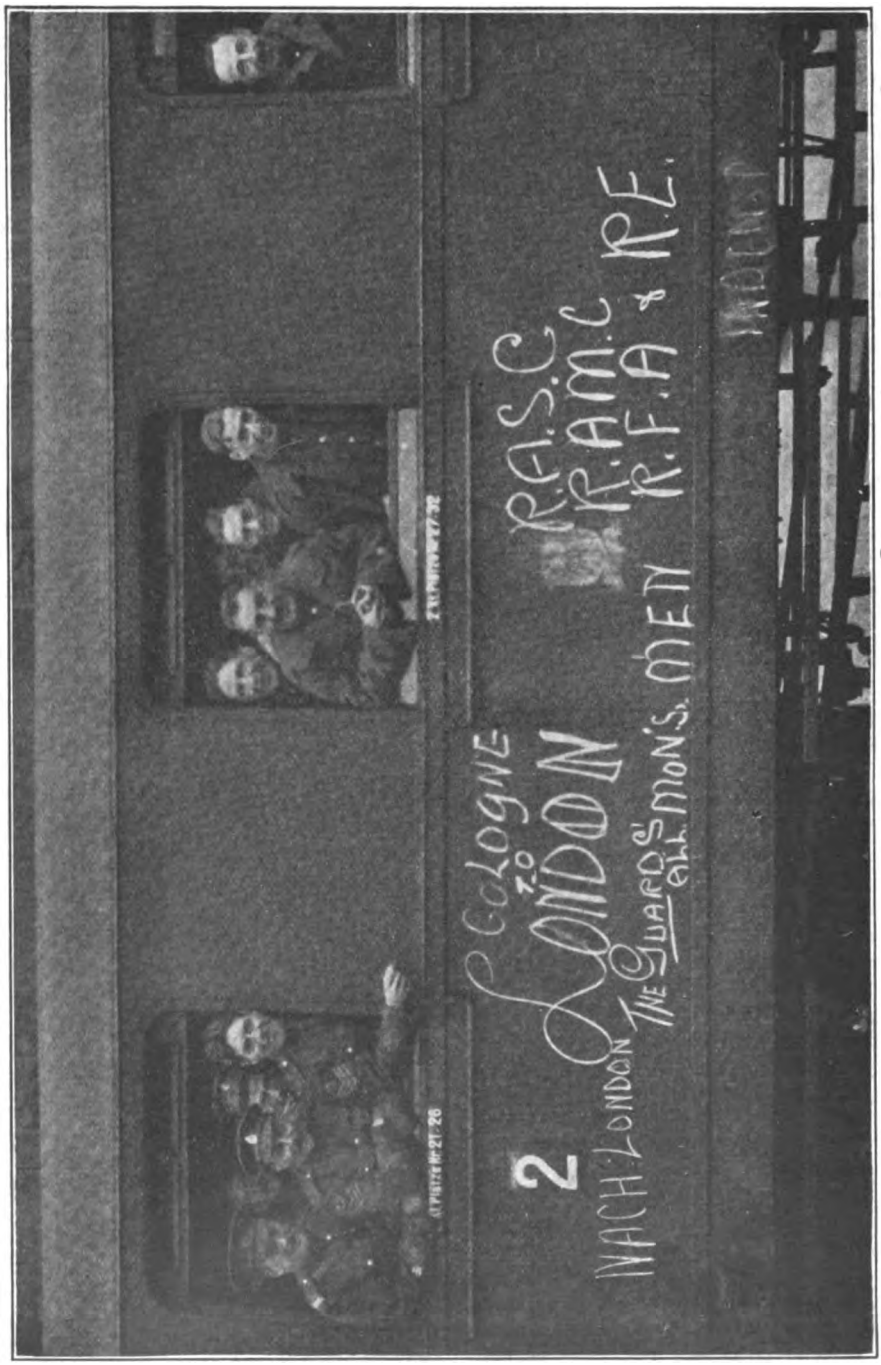

THE LAST OF THE GUARDS LEAVING COLOGNE FOR "BLIGHTY."

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Hazebrouck practically impossible. All through trains were diverted via St. Omer, Arques and Aire.

The consequent diversion of still more trains on to the already overcrowded coast lines between Calais and Abbeville naturally produced still further delays, but when the volume of traffic that was dealt with is taken into consideration one is led to the conclusion that, on the whole, the movement of supplies, &c., was kept going remarkably well.

To give the reader an idea of the conditions under which the work was being performed in May, 1918, one case may be cited. An R.O.D. engine stationed at Arques worked a train through to Noyelles (midway between Etaples and Abbeville). It was then utilised by the Nord Railway to work a troop train destined for Pernes-en-Artois via Montreuil and St. Pol, as no other engine was available. No advice was received from the French at Noyelles that this engine was working the train, and the first advice received at Ligny came from the Hesdin train reporter that this particular engine was working the train. On arrival at St. Pol the engine was unable to proceed further as all the coal in the tender was exhausted, and, incidentally, the enginemen had been on duty 25 hours.

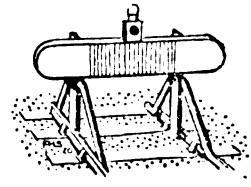
Meanwhile, new construction work was being pushed on to enable some relief to be given to the overcrowded sections of the Nord line. The two principal lines constructed were those from Hesdin to Frevent—to ease St. Pol—and from Conchil-le-Temple (between Etaples and Abbeville) to Candas, to ease both St. Pol and Doullens. Actually the general advance had begun in the August, before either of these lines were of any assistance.

Having been invalided to England in August, 1918, the writer is, unfortunately, unable to complete the account of the working during the great and final advance, but from accounts he has heard from his men the last four months of 1918 must have been the most thrilling of all, and the amount of work done, and the skill displayed in meeting the constantly increasing demands owing to the longer haul from the bases, was remarkable.

An impression may have been given in the foregoing remarks that the Nord Railway was in an almost chaotic condition during the six months from March to August, 1918. The writer cannot conclude without pointing out that the problem with which the French railway officials were faced was one of the most difficult that could have been devised, and when the limited area in which the vast supplies for the British—and, later, part of the American—forces had to be dealt with is taken into account, the actual working results speak volumes for the ingenuity and ability of the Frenchmen, to work with whom the writer will always consider was one of the finest experiences it would be possible to have.

The growth of the Railway Operating Division was, indeed, remarkable. Starting in May, 1915, with six engines working at Boulogne, by May, 1918, there were at least a thousand locomotives running daily.

This fact alone seems conclusive proof that the work of the Division was considered successful by the Army Headquarters Staff. Much of the success attained must be attributed to the officer commanding the Division. Colonel Paget had already made himself famous in the railway world prior to the war by the remarkable work he had performed on the Midland Railway. In France he found still greater opportunities for displaying the ability and ingenuity that had marked his career in England. A perfect French scholar, he was a *persona grata* with all the French officials, and the cordial relationship existing between the Nord Railway and the R.O.D. was largely due to the popularity of the British unit's commander, under whom it was the writer's privilege to serve.



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Railway Officers as Directors.

AN IMPORTANT "UNDERGROUND" DEVELOPMENT, AND NEW APPOINTMENTS.

IN view of the trend of public comment in regard to the inclusion of others than direct representatives of the shareholders on railway company directorates, the new scheme of organisation inaugurated by the associated "Underground" companies is a development of great importance. Lord Ashfield, as Managing Director, provided a link between the directorate and the operating departments, but three of the principal officers have now been advanced to directorships. These gentlemen are: Mr. H. E. Blain, C.B.E., Operating Manager and Mr. F. Pick, Commercial Manager, who become Assistant Managing Directors; and Mr. Z. E. Knapp, Manager for Maintenance and Construction, who becomes Director for Construction (Railways).

This step is in accord with modern tendencies in management and indicates also that the avenue of promotion is made more open than before. It also recognises the importance of the management side, and the need of intimate relationship between the Boards and those directly engaged in management.

There are few more popular men associated with the "Underground" companies than Mr. H. E. Blain, and the fact that he becomes an Assistant Managing Director will be viewed by all as a compliment to the operating staff of which he has been the head for some years, as well as to him personally. Indeed, his appointment we are sure will be hailed with the greatest satisfaction in "Underground" circles, where his kindly interest in the welfare of his subordinates and the zeal he has displayed in connection with the "Safety-First" movement, of which he is an hon. secretary, have rendered him a very popular figure with all ranks. Mr. Blain has held the post of Operating Manager to the Underground Group since January, 1915—a period of unusual difficulty. He joined the "group" in June, 1913, as Purchasing Agent, but in October of that year he "changed over" and became Operating Manager of the omnibus section of the combine. Mr. Blain gained his experience first with the Liverpool Corporation which, when Principal Traffic Assistant on their extensive tramway system, he left in 1903 in order to become first Tramways Manager of West Ham, where he was responsible for the organisation of the system. He was a member for several years of the Executive of the Municipal Tramways Association, being President in 1911–12. Mr. Blain's name is associated with a number of commercial and other publications, including one on "Office Organisation and Management," of which he was joint author with Professor Lawrence R. Dicksee, F.C.A., which had a large circulation. He takes an active interest in various organisations and is Hon. Secretary of the Institute of Transport.

Mr. Frank Pick, who also becomes an Assistant Managing Director, has long been a quiet but compelling personality at Electric Railway House. Mr. Pick, it is interesting to recall, was for some years at the head of the Publicity Department of the London Underground Railways. In this sphere he achieved such success that he was subsequently appointed Commercial Manager. In 1917, he was appointed an Assistant to the Controller of Mines (the late Sir Guy Calthrop). At that time Mr. Pick's special task was to deal with matters in connection with the London coal distribution scheme—a work of no small magnitude—and he carried out his duties with distinction to himself and credit to the country for nearly two years. In 1919, certain changes were made in the personnel of the Coal Controller's Department and Mr. Pick, then head of the Household Fuel and Lighting Branch, was obliged by reason of the increased work devolving upon him in his capacity as Commercial Manager of the Underground Railways to relinquish his executive function though he consented, at the Controller's request, to continue to advise upon the administration of the branch.

Mr. Z. E. Knapp, the third officer to

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join the Board, as Director for Construction (Railways), was appointed in January, 1915, Manager for Maintenance and Construction. He had held the position of Chief Engineer to the Underground Electric Railways Company, Ltd., for nearly two years previously. His first appointment in connection with these lines was that of Assistant Engineer, in 1901, and he was closely identified with the electrification and modernisation of the District system, and with the construction and equipment of the London Electric "tubes." He has had much to do with the erection of the power-house at Lots Road and the new rolling stock, though these, and also the engineering work proper of the respective lines, are actually under the control of the departmental chief officers. In 1910, Mr. Knapp became General Manager of the London United Tramways, returning in 1913 to be Chief Engineer of the Underground Electric Railways Company, Limited. During the years 1916–18 he was also General

Photo.] [*Elliott & Fry.*

MR. H. E. BLAIN, C.B.E.,

Appointed an Assistant Managing Director, Underground Electric Railways Company of London, Ltd., and Associated Companies.

Manager to the Associated Equipment Company, Limited. Mr. Knapp has not come so prominently into the limelight of public attention as have Mr. Blain and Mr. Pick; but behind the scenes he has for years exercised a strong influence in

Photo.] [*Hugh Cecil.*

MR. FRANK PICK,

Appointed an Assistant Managing Director, Underground Electric Railways Company of London, Ltd., and Associated Companies.

the direction of progress, and his elevation to the Board will also meet with general approval.

Partly consequent upon these appointments, several other important changes have been made in the organisation and personnel of the combined companies. Mr. A. R. Cooper, Assistant Manager for Maintenance and Construction and Engineering, becomes Chief Engineer (Railways); Mr. G. J. Shave, Chief Engineer (Omnibuses); while Mr. J. C. Mitchell, F.C.I.S., Treasurer, takes the title of Secretary and Treasurer.

At the same time, the management of the London and Suburban Traction Group (the Metropolitan Electric, London United and South Metropolitan Electric Tramways), has been brought into direct connection with the Underground management, and the following appointments made: Mr. C. J. Spencer, General Manager; Mr. E. Boys, Secretary and Treasurer.

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Seeing that the traffic of the associated companies is entirely passenger, it is interesting to note that during the year

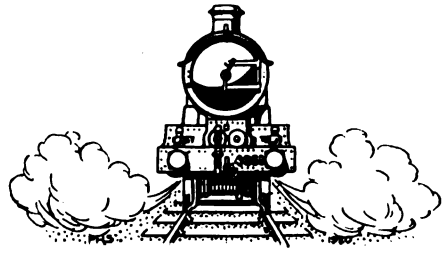
MR. Z. E. KNAPP,

Appointed Director for Construction (Railways), Underground Electric Railways Company of London, Ltd., and Associated Companies.

ended December 31, 1920, no fewer than 1,171,701,868 passengers were conveyed. Of this total, the omnibuses accounted for 767,953,640, but both the London Electric and the Metropolitan District Railways carried considerably over 100,000,000 passengers each, the total in the former case being 164,590,102, and in the latter 147,699,340. These totals are to some extent estimated, in that they include computations as to the journeys made by season-ticket holders, but bearing in mind that the approximately 400,000,000 passengers carried on the District and the three tube railways are distributed over a total of 63 miles only, some idea can be obtained as to the volume of traffic and the management and maintenance problems with which the officials of the associated companies have to deal.

During this period nearly 74,000,000 passengers travelled with workmen's tickets, and over 56,000,000 season-ticket journeys were made, these applying only to the railway services. Notwithstanding these enormous totals, the average fare paid on the Metropolitan District and London Electric Railways was only 2·49d., on the Central London Railway, 2·64d.; on the City & South London Railway, 2·06d.; and on the omnibus journeys, 2·04d.; giving an average of 2·18d. for the whole. In view of the "revised" fares which applied during part of the period, it is of interest to note that the highest increase, on the London Electric Railway, was only ·3d., and the average for the whole system ·19d.

During last year, four additional trailer cars on the Metropolitan District Railway cost £19,000, new rolling-stock on the London Electric Railway entailed an expenditure of £65,000, and on the Central London Railway, £24,000. New motor omnibuses and equipment added by the London General Omnibus Company, Limited, cost £290,000. On the engineering side, the new subways at Charing Cross accounted for £13,000, and a further £140,000 was spent on land and buildings.



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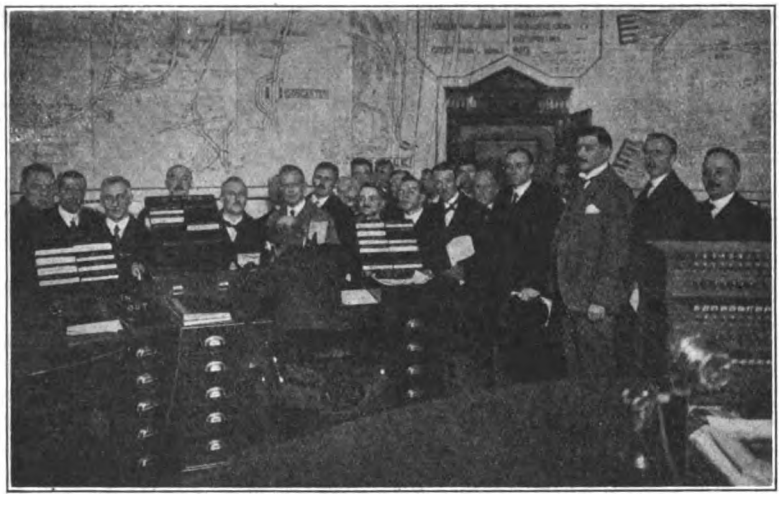
The Institute of Transport Congress in Manchester.

ON January 27, 28 and 29 Manchester was the scene of the first Congress organised by the Institute of Transport, attracting a large number of transport personalities, including many well-known railway, road, tramway, canal, dock and port officers, to the great Lancashire manufacturing and trading centre.

The local committee responsible for the arrangements held an informal reception at the Midland Hotel on Wednesday evening, January 26, but the official proceedings did not commence until Thursday morning, when the Lord Mayor of Manchester (Alderman William Kay, J.P.) welcomed the delegates on behalf of the Manchester Corporation. The meetings took place in the Town Hall, and the Lord Mayor, in his address of welcome, stated that the business in which they were interested was of the greatest moment to the city at the present time, and he considered there was great cause for meetings of the kind.

Sir Henry P. Maybury, Director-General of Roads, Ministry of Transport, who presided at the meetings of the Congress owing to the indisposition of the President (Lord Ashfield), briefly thanked the Lord Mayor and the Manchester Corporation for their welcome to the City, and after calling on the delegates to stand in silence for a moment in sympathy with the victims of the Cambrian railway disaster and in condolence with the officers of that company, the formal business of the day began.



INSTITUTE OF TRANSPORT CONGRESS AT MANCHESTER.

Visit of Delegates to the Lancashire & Yorkshire Railway Train Control System. Mr. Ashton Davies, M.B.E., Superintendent of the Line, in the foreground to the right.

In opening the proceedings the chairman read a message from the President expressing disappointment that owing to indisposition he could not attend the Congress. In the message Lord Ashfield said: "Transport has aptly been described as the life-blood of a nation. It is my firm belief that the Institute will shortly be regarded as one of the main arteries through which that life-blood will flow to the heart of British industry and commerce; also that it will become

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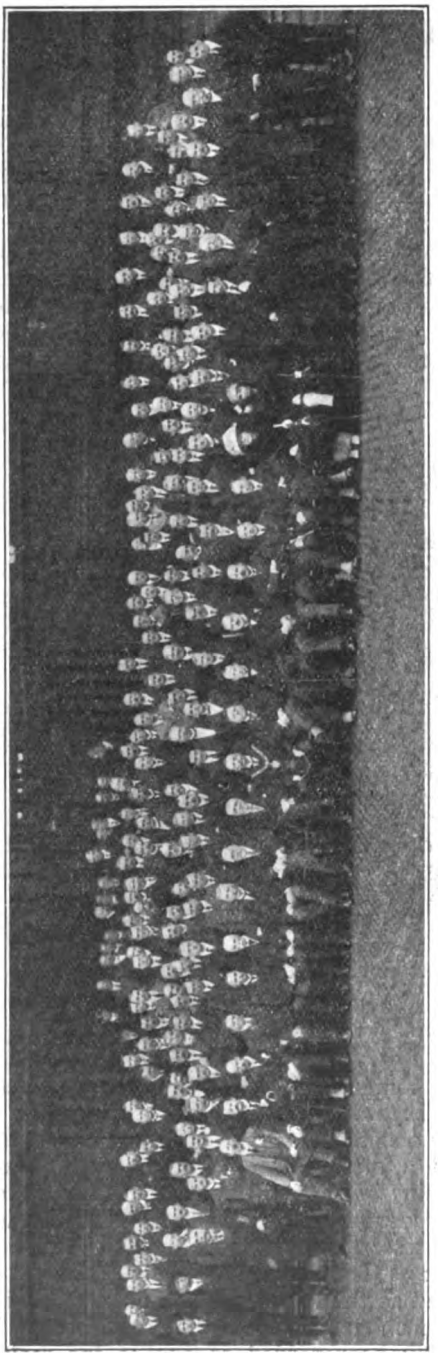

Photo.] INSTITUTE OF TRANSPORT CONGRESS AT MANCHESTER. GROUP OF DELEGATES AT THE TOWN HALL. [*Lafayette.*
The Lord Mayor of Manchester (Alderman W. Kay, J.P.) in middle of front row. On his left is Sir Henry Maybury, Chairman of the Congress.

a valuable and indispensable medium for raising the status of transport officials and for training those upon whom the responsibility of the future development and direction of transport will fall."

Four papers were down for reading and discussion at the Congress, but although one entitled "Behind the Scenes in a Railway Locomotive Workshop" was of railway interest, there was a regrettable absence of information from the traffic aspect throughout the Congress. The other papers dealt with Mechanical Road Transport, Roads and Road Transport and the Problem of the Canals.

The first paper, read by Mr. C. le M. Gosselin (Managing Director, H. Viney & Co., Limited, Preston), was entitled "An Historical Survey of Mechanical Road Transport," and was illustrated with some excellent lantern slides. It dealt almost entirely with the development of the mechanically-propelled road vehicle. The second paper, "Behind the Scenes in a Railway Locomotive Workshop," read by Mr. J. W. Smith, Locomotive Works Manager, Great Central Railway, Gorton, was confined to a description of the manner in which a locomotive is manufactured. It dealt in a clear manner with the necessity for synchronising the movement of material and parts in order to effect best results at minimum cost, and showed by a striking series of lantern slides how the locomotive was gradually built up. Both interesting and instructive, this paper was a valuable contribution from the railway point of view, although its character precluded discussion.

Mr. H. H. Gordon (L.C.C.) opened the discussion on the two papers, and in his remarks made a powerful plea for the co-ordination of all forms of transport. He did not say much on the subject-matter of the papers, however, nor did many of the other speakers. Mr. H. Kelway-Bamber (London Manager of the Leeds Forge Company) and Mr. T. A. Kenyon (Assistant to the General Manager, Lancashire and Yorkshire Railway) made useful additions to the discussion from the railway point of view.

"The Problem of the Canals" was the title of the paper read by Sir John Eaglesome, K.C.M.G., General Manager, Aire and Calder Navigation.

One statement in the paper is of interest,

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coming from an acknowledged authority in regard to canals, to the effect that in the early days "railway projects were only allowed to proceed on condition that the railways purchased the interests of the canal shareholders." It is somewhat refreshing to find an authority on canals admitting that the railways were *compelled* to buy out many of the canal interests.

The final paper entitled "Roads and Road Transport," was read by Mr. J. Cracroft Haller, County Surveyor, Nottinghamshire. The theme of the paper was the making of roads to meet future traffic requirements in connection with mechanical transport, and Mr. Haller made it clear that considerable expenditure would be involved in building adequate foundations for the roads which, he said, for the most part had no foundations at all.

A series of interesting visits of inspection had been arranged by the local committee, and a large number of delegates assembled on Friday morning to visit the Manchester Ship Canal and docks. Special tramcars conveyed the delegates from the Midland Hotel to the Pomona Docks, where they embarked for a tour of the canal and docks. Skirting the Pomona Docks, the vessel passed by the Trafford Road Swing Bridge and turned into No. 8 dock at Salford, thence passing into the new dock (No. 9) where the delegates landed to inspect the transit sheds, the handling appliances and the grain-conveying arrangements. Embarking again on the other side of the dock after passing through the lower floors of the grain elevator, the delegates were taken along the canal through the Mode Wheel locks and by the Manchester dry docks to the Barton Aqueduct, which carries the Bridgewater Canal over the Manchester Ship Canal. The aqueduct was turned specially for the edification of the visitors, who were exceedingly interested in this method of cutting a canal and turning a portion of it in order to leave the lower channel free for the passage of vessels.

On Friday afternoon visits were paid to the Train Control System and the School of Signalling of the Lancashire and Yorkshire Railway at Victoria Station, and also to the car shed and car building works of the Manchester Corporation Tramways, Hyde Road. The majority of the delegates selected the first visit. Mr. Ashton Davies, M.B.E., Superintendent of the Line, Lancashire and Yorkshire Railway, personally received the delegates in the Train Control room and superintended the explanations of his staff, while Mr. T. W. Royle, M.B.E., Assistant Superintendent of the Line, similarly acted in the School of Signalling. These visits were most enjoyable and instructive, and the delegates were much impressed with the excellent system of train control in operation on the Lancashire and Yorkshire Railway, and also with the extremely comprehensive arrangements made for the teaching of signalling to the staff of the company.

Other visits were arranged for Saturday, January 29, and groups of the delegates inspected the industrial estate at Trafford Park, the Lancashire and Yorkshire electric railway line to Bury and Clifton Power Station, the Bridgewater Packing Warehouse and the Liverpool Docks, all these visits being greatly appreciated.

Manchester has always been noted for its civic hospitality, and its reputation was well maintained in connection with the Transport Congress. Apart from the official reception given to the delegates by the Lord Mayor on Thursday morning, a conversazione was held at the Town Hall on Thursday evening, at the invitation of the Lord Mayor and the members of the Tramways Committees. Two official luncheons were also held, the first on Thursday, at the Town Hall, at the invitation of the Tramways Committee of the Manchester Corporation, and the second on Friday, at the Midland Hotel, at the invitation of the Manchester Ship Canal Company. In the Town Hall, on Thursday, the Lord Mayor of Manchester (Alderman William Kay) made a striking speech and explained how pleased Manchester was to be associated with such a progressive body as the Institute of Transport. Sir Henry Maybury, Chairman of the Congress, briefly replied. At the Friday luncheon, Mr. W. C. Bacon, Chairman of the Manchester Ship Canal Company, was the proposer of the toast, which was responded to by Mr. E. S. Shrapnell-Smith, C.B.E.

The success of the first Congress of the Institute of Transport cannot be doubted, and though we have deemed it necessary to refer to the relative absence of "traffic"

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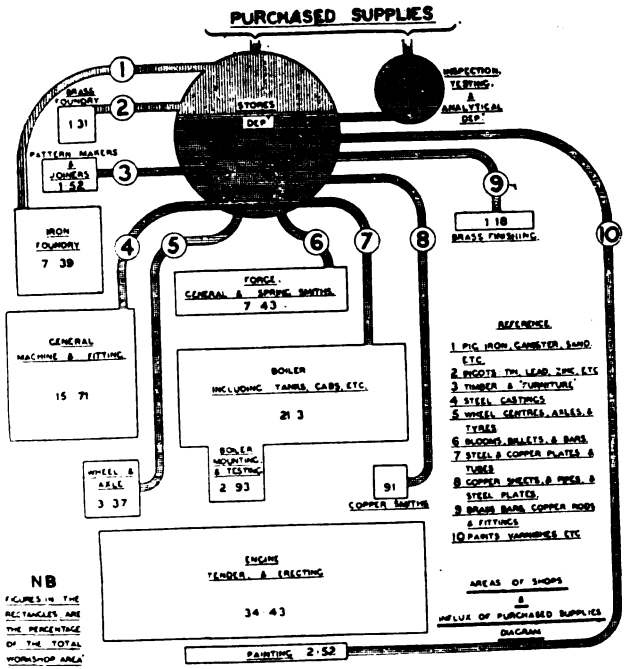
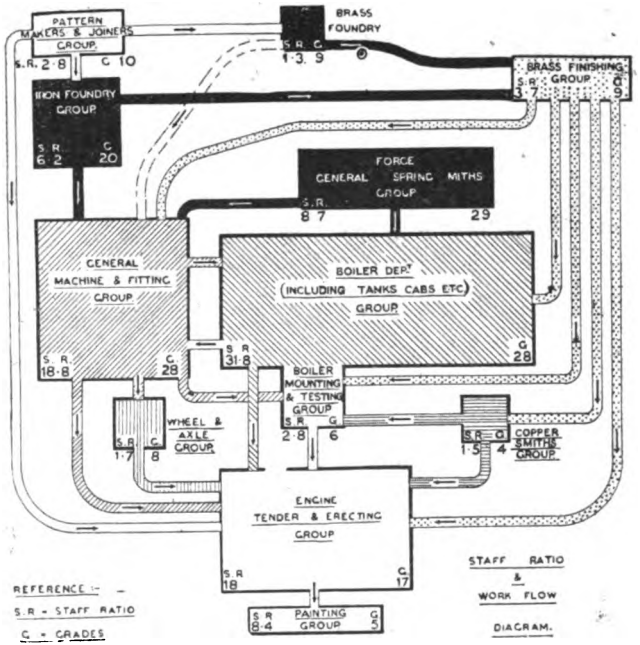


HYPOTHETICAL GROUPING OF THE VARIOUS DEPARTMENTS IN WHICH LOCOMOTIVE WORK IS PERFORMED.

The areas show, approximately, the floor space in each department, and the figures in these areas the percentage of the total area of the workshops included. The ways or paths indicate the flow of the main items of purchased supplies from the manufacturers through the stores department to the various shops. These supplies are divided roughly into two groups: those which are purchased and supplied directly to the stores department and those which are purchased in accordance with a specification, tested and inspected before delivery by the inspection staff; and the diagram includes, with these the analytical chemist's part of the railway organisation.



STAFF RATIO AND WORK FLOW.

The areas correspond to the relative number of hands employed in these departments, and the figures with SR prefixed are the percentage of the total works staff; the figures with the letter G prefixed correspond with the approximate number of trades employed in each department. The ways or paths from group to group indicate the direction of flow of work from department to department until the whole finally finds its way into the erecting shop, where the parts are assembled. From this shop the locomotive passes to the paint shop and then to the running department to be put into service.

BEHIND THE SCENES IN A RAILWAY LOCOMOTIVE WORKSHOP.

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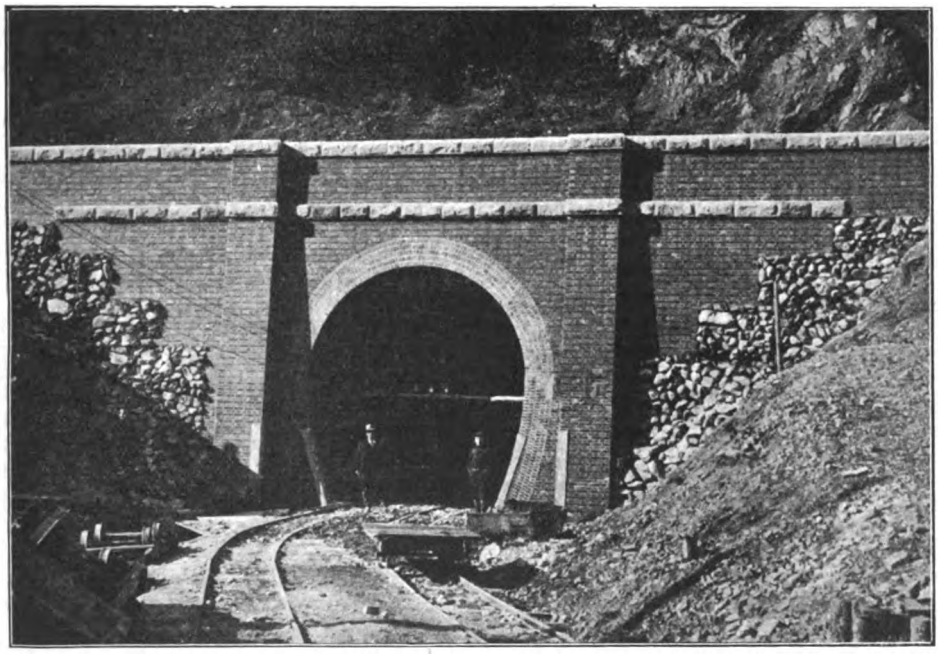
value in the papers, this should not be interpreted wrongly. From some points of view the papers were excellent, but to railwaymen, who, after all, are strongly represented in the Institute of Transport, there was little or nothing suitable for discussion. We have reason to believe that the papers for the next Congress will deal more particularly with the "traffic" question, and there for the moment we may leave the subject.

The delegates to the Congress were unanimous in their appreciation of the excellent arrangements made for their edification and enjoyment, and the local committee is to be congratulated on them.

Mr. J. W. Smith's paper, "Behind the Scenes in a Railway Locomotive Workshop" included the interesting diagrams reproduced on the opposite page, which, with the explanatory notes attached, are most instructive.

LONG RAILWAY TUNNELS IN JAPAN.



EASTERN ENTRANCE, MOUNT TORII TUNNEL.

A LARGE part of the Japanese Empire is very mountainous, especially in the Main Island, and railway construction has therefore entailed heavy engineering works, notable bridges, long tunnels, deep cuttings and high embankments, while gradients on many sections are as severe as 1 in 30 or 1 in 40. Quite a number of the tunnels exceed one mile in length, and the followfng list is of interest:—Sasago, 15,279 ft.; Kobotoke, 8,350 ft.; Mount Yadake, 6,864 ft.; Hirase, 6,581 ft.; Momomi, 6,040 ft.; Ashiya, 6,029 ft.; Mount Torii, 5,478 ft. Besides these there are many not much shorter, and on a new line between Kozu and Numazu via Atami, there is one stated to be 5 miles in length.

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The Departmental Committee on Railway Agreements.

A NUMBER of important issues are raised by the report of Lord Colwyn's Committee. The outstanding feature of the evidence, and which is frankly admitted by the Committee, is that, whatever criticisms may be advanced, the Railway Executive Committee acted from the first in the best national interests; there was neither time nor opportunity to decide all the details of exact agreements (as one witness pointed out, the war would have concluded ere all could have been settled); at times they assumed acting or negotiating authority which, had it been challenged, might not have been supported, or which had to be confirmed afterwards. The work they did was, however, entirely public-spirited, and the Railway Executive Committee was alive to many possibilities of undue advantage being taken of the literal interpretation of agreements in particular cases, and took measures and set up investigation and control committees designed to prevent this, as well as to unify and co-ordinate accounting and other action on the part of the railway companies under government control and guarantee.

Lord Colwyn's Committee is chiefly exercised over the fact that the original agreement removed the limitations upon the guarantee imposed by the words proposed by the Board of Trade: "*less any amount of such deficiency attributable to causes other than the operation of the Regulation of the Forces Act*, 1871."

The evidence shows that these words were eliminated for good and sufficient reasons; the whole situation was complicated by the changing conditions and new factors which arose, The Committee adopts the view, however, that while giving full recognition to the public-spirited attitude adopted throughout by the members of the Railway Executive Committee, their position in regard to the negotiations was one of advantage. "And as time went on, the interpretations and amplifications of the original agreement resulted in the gradual bettering of the bargain in favour of the railway companies." They suggest, too, that the fact that throughout the negotiations the Railway Executive Committee realised a spirit of good faith, mutual trust and fair dealing, should find its counterpart in the settlement of outstanding questions now under discussion. As to this, we may point out that any suggestions that the railway companies contemplated action in any other way is premature; later on in the report an estimate of £150,000,000 is given, but it is emphasised that the figures "are merely estimates of the amounts the railway companies' claims might possibly reach," and the railway companies are at present "unable to furnish an estimate of the claims they may put forward at the end of the period of possession,"

Two members of the Committee, Major Harry Barnes, M.P., and Mr. William Graham, M.P., sign the report with reservations, mainly on the ground that the limiting words above mentioned can yet be re-instated and the various agreements modified accordingly. The principal recommendations of the Committee are:—(1) That charges for maintenance in excess of the 1913 guarantees appearing in the companies' claims now under examination or hereafter submitted, should not be allowed; . . . . any company claiming to have incurred expenditure on making good abnormal wear and tear properly chargeable to Government account should substantiate its claims in accordance with the conditions hereafter indicated.

(2) Current payments on account of arrears of maintenance other than proper renewals provision should be discontinued.

(3) The companies should utilise funds already paid to them, on account of arrears of maintenance, in defraying the whole cost of overtaking deferred work before receiving further payments on account of the additional cost of arrears overtaken.

(4) No payments should be made in

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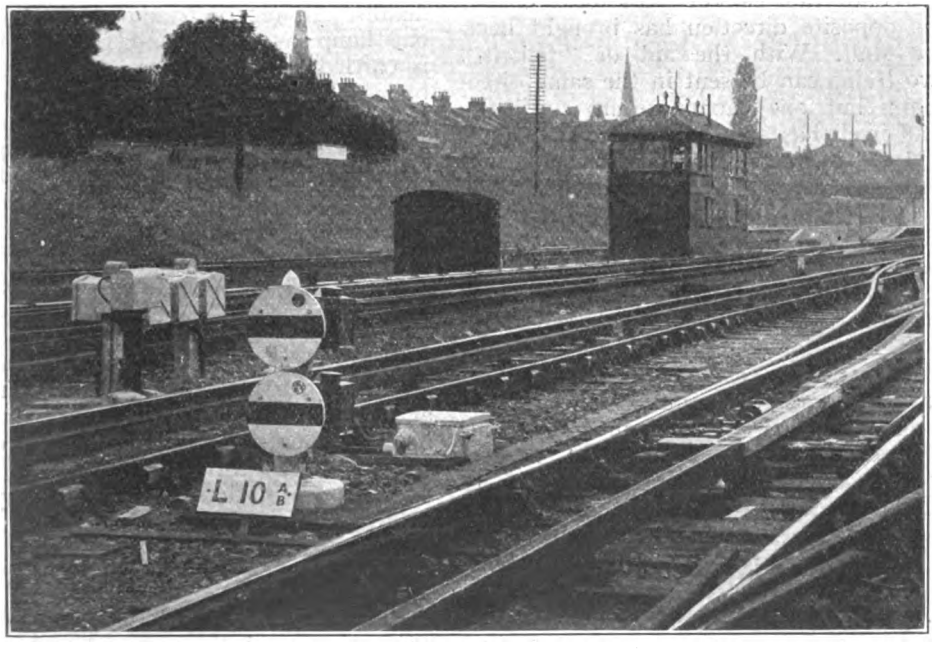
respect of arrears of maintenance outstanding at the end of the period of control, except to the extent to which it may be possible to show that amounts already paid are insufficient for making good physical arrears that may actually require to be overtaken.

(5) Claims in respect of abnormal wear and tear must be justified that such abnormal wear and tear has been due to Government user, and has not been counterbalanced by sub-normal wear elsewhere.

Other recommendations relate to non-productive capital expenditure; and it is contended that the agreement as to replacement of stores should be reviewed. Finally, existing arrangements under which the claims of individual companies are investigated by railway accountants, with whom officials of the Ministry of Transport are associated, should be continued and extended as may be considered necessary.

It remains to be seen how this report will be viewed by the railway companies, and no doubt comments will be made which may put a rather different complexion upon some of the recommendations set forth. For example, it is one thing to discuss the agreements thus critically at this date; but railways were, owing to their special devotion to national requirements during the war, prevented from developing in any way, and they are still handicapped in many respects which do not apply to general trade and industry, as a result of measures taken during the war period and the after effects. Incidentally, railway workshops were among the largest munition factories, realising a war output estimated at £17,000,000; *but this was all paid for at cost price.*

POWER-OPERATED GROUND DISC SIGNALS, EALING & SHEPHERD'S BUSH RAILWAY.



TWO-POSITION POWER-OPERATED GROUND DISC SIGNALS AT EALING BROADWAY.

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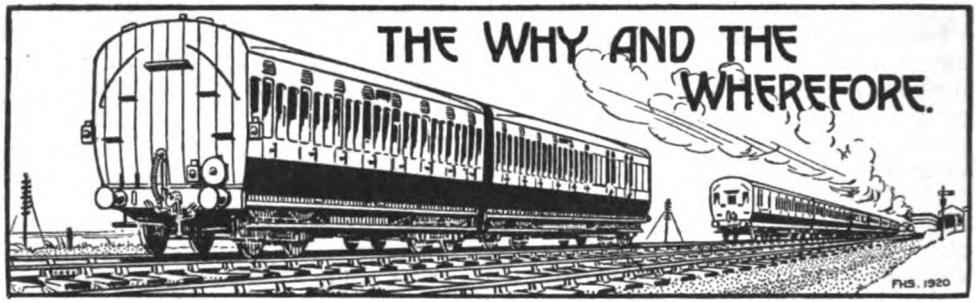

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," the twenty-third Annual Edition, published in April,* 1920, *is out of print, but a new one is in preparation, in readiness for publication in April,* 1921.

The Tablet System.

The ruling idea is that no driver is allowed to travel over a single line section of railway unless he holds a "tablet" *for that section of line,* while the apparatus is so designed that under no circumstance can two tablets be in use at the same time. With the ordinary staff apparatus a second train cannot pass until one in the opposite direction has brought back the staff. With the aid of "tickets" two trains can be sent in the same direction; but one cannot return until the staff itself has gone through. The tablet system overcomes this difficulty and effects a close control upon working. The electric train staff system operates in exactly the same way, except that small "staffs" are used instead of tablets and the instruments, of course, differ in form and construction. The tablets can, however, be obtained from either of the two instruments at each end of the section, or replaced in either; but whether one instrument has 10 and the other 13 or one 18 and the other 5, if the total is 23, a second cannot be obtained from either. These tablets are usually placed in pouches with a wire handle for holding, and it is the duty of a driver to see that he has the right tablet as soon as he receives it. This was partly the trouble in the recent Cambrian railway accident: the local train driver was given the wrong one; but he ought to have found this out for himself, so that part of the blame attaches to him and cost him his life.

[Reply to B. SHAW.]

Standard Head Codes.

This information has been given several times, and we must refer you to the RAILWAY YEAR BOOK, where a complete series of diagrams is reproduced, for full details. In regard to those you specify, one lamp over left-hand buffer (facing) is carried by through goods, mineral or ballast trains, stopping intermediately; one over right-hand buffer applies to ordinary goods or mineral trains stopping intermediately; one at foot of chimney and one centre of buffer beam signifies a class B express goods or cattle train; and one over left-hand buffer and one centre of buffer beam indicates a goods, mineral or ballast train conveying a through load to destination. Express fish, fruit, &c., trains composed of passenger stock carry one lamp at foot of chimney and one over the left-hand (facing) buffer. Shunting engines generally carry a red and a white light at each end. Specials are variously indicated by an additional green or purple light, and sometimes not at all.

[Reply to W. D. SPENCER.]

Midland Railway, Bradford Direct Line.

Completion of this scheme was abandoned some time ago. The only portion of the proposed lines at present in use is

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that which leaves the Midland main line at Royston and joins the Lancashire and Yorkshire main line near Thornhill, with independent goods branches to Huddersfield and Dewsbury. For a time through Midland trains were run into Bradford, using Lancashire and Yorkshire metals beyond Thornhill, but since the war the only services revived over this route have been those between Sheffield and Halifax, worked by the Lancashire and Yorkshire, with through coaches between St. Pancras and Halifax and Huddersfield. Had the original scheme been carried through from Dewsbury to a junction with the Midland line at Bradford, the Midland route to the north would have been shortened considerably.

[Reply to W. CAVAN.]

"Claughton" Class Engines, London and North Western Railway.

None of these engines was sent to France. We know of no "Record of records" behind an engine of this type; on an official trip No. 1159, *Ralph Brocklebank*, ran a train of over 300 tons from Crewe over Shap Summit into Carlisle, 141 miles, in 142½ min. Mr. Cecil J. Allen has also recorded a fine performance behind No. 2222, when a 310-ton train was worked from the dead stand at Oxenholme up the 18⅝ miles mountainous ascent to Shap Summit in 23 min. 11 sec. (See October, 1918, RAILWAY MAGAZINE.)

[Reply to "CLAUGHTONIAN."]

Colours of Railway Coaches.

The London and South Western Railway have a number of green-painted vehicles used for steam trains, while "red-chocolate-brown" has for some years been the standard on the Great Western Railway. We cannot say whether the former will ultimately become general, nor are we aware that any further change is contemplated by the latter railway. The matter is, however, continually receiving attention, and the "bright mauve" dining car noted by you may have been a Great Western experiment in this direction.

[Reply to R. N. C. CLEMENTS.]

Fishplates.

Credit for the invention of the fishplate is usually given to R. L. Stevens, of the Perth and Amboy Railroad, U.S.A., where fishplates were introduced in 1830. It was not until 1847 that the first fishplates were used in Great Britain, as the patent of William Bridges Adams and Robert Richardson; only one plate was used in those early days, and a royalty of 6d. per fish-joint was exacted by the patentees. We are unable to trace how the distinctive title of "fish"-plate came to be adopted.

[Reply to CHARLES HAMMOND]

Large "Through" Stations.

Clapham Junction (London and South Western and London, Brighton and South Coast Railways) has a total of 17 platform lines, all of through type, though some are used terminally. Twelve trains can, however, run through the station simultaneously. At Vauxhall, on the same line, there are eight through platform lines. At Willesden Junction, including the high level station, there are nine through platform lines, though three of these are not used as such.

[Reply to N. M. R. WILSON.]

Electric Services, London, Brighton and South Coast Railway.

Electric services are regularly operated between London Bridge and Victoria, via the South London line, and via Tulse Hill to Balham and Clapham Junction, from London Bridge to Crystal Palace via Tulse Hill, and from Victoria to Crystal Palace. Electric trains are also worked from Victoria down the main line as far as Selhurst, and then round to the car sheds, also from Crystal Palace through Norwood Junction, but these are not regular services.

[Reply to R. NEWMAN and J. BLACK.]

London and South Western West of England Main Line.

Seeing that this company could not expect to compete effectively with the Great Western Railway for the London-Exeter traffic, in consequence of the far harder grading of the London and South Western route, there would be no object in running non-stop from Waterloo to Exeter. Important connections are made by the West of England trains at Salisbury and locomotive working is also greatly simplified by the ability to change engines at Salisbury.

[Reply to "LADY OF QUALITY."]

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London and North Western and London Electric Joint Stock.

Presumably ordinary Central London and "Bakerloo" vehicles are still in use on the through Watford trains until all the new joint stock is available, but we are not aware as to how far delivery has been completed. Your suggestion that because cars remain in the sidings at Ealing Common Works they are not receiving attention is not justified. They have to wait their turns for repair. Furthermore, it may not always be the same cars that you have seen.

[Reply to L.C.N.]

Inter-Station Distances.

The following station to station distances exceeding 10 miles may be mentioned:—North British Railway, Rannoch and Tulloch, 17¼ miles (private station between); North British Railway, Bridge of Orchy and Rannoch, 15½ miles (private station between); Caledonian Railway, Beattock and Elvanfoot, 13 miles; Highland Railway, Struan and Dalnaspidal, 11¼ miles; Highland Railway, Dalwhinnie and Newtonmore, 10¼ miles; London and South Western Railway, Basingstoke to Micheldever, 10¼ miles.

[Reply to "N/C."]

Waterloo & City Railway.

We are not sure as to the actual location of the "City" station on this line, but its general whereabouts can be ascertained by noting the direction of the incline by which it is reached from the Bank subways. It has been suggested that the line should be extended to join the London and South Western Railway main line, but no definite proposal has been brought forward. With such a connection made, obviously through trains could be run.

[Reply to A. A. Cox.]

Largest Railway Stations.

We have many times given this information, and complete details are given in the RAILWAY YEAR BOOK. The following are the numbers of platforms at the stations you mention:—Edinburgh—Waverley 19 and Princes Street 7; Glasgow—Central 17, St. Enoch 12, and Queen Street 10. These include the low level stations at Glasgow Central and Queen Street, and the suburban station at Waverley.

[Reply to J. H. LEACH.]

Great Northern Railway 0-6-2 Superheated Tank Engines.

These engines will ultimately form a series of 60 of an entirely new design. The 10 commencing at No. 1606 are being built at Doncaster and the 50 commencing at No. 1721 by the North British Locomotive Company, Limited. They are not fitted with both the Westinghouse and vacuum brakes as you state, what you mistake for a Westinghouse pump in front of the right-hand side tank being a feed-pump.

[Reply to J. A. DICK.]

Snifting Valves.

The main purpose of these valves is to relieve pressure in the cylinders when running with steam shut-off, when the pistons tend to act as air pumps. They are also used in connection with the superheater, to allow air access to the superheater tubes for cooling when steam is not passing, and to allow escape of steam remaining in the elements or supplied through a circulating system when its pressure exceeds a safe maximum.

[Reply to "SUPER G.C.R."]

Midland Railway Locomotives.

As previously explained in these columns the sound of locomotive exhaust is regulated by the design of the chimney, the petticoat, and the exhaust orifice. You are not sufficiently explicit in regard to the locomotives concerned in the second part of your query, and in addition these constant inquiries after tractive force, although as an "act of grace" we have answered several heretofore, contravene our rule as to dimensions.

[Reply to G. H.]

2-6-0 Goods Engines, South Eastern and Chatham Railway.

Why should these locomotives *not* be employed on the Red Hill and Reading section? The haulage of heavy goods trains coming off the Great Western system into the South Eastern and Chatham area over this severely-graded route would seem as ideal a duty for such powerful engines as could be found on the South Eastern and Chatham Railway. The numbers now run from 810 to 815.

[Reply to R. STRINGER.]

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The "Biggest" Locomotive.

We cannot answer queries unless something more precise than "biggest" is specified. It may mean heaviest, longest, or, on the basis of tractive effort, most powerful; and three entirely different types might lay claim to the same distinction on these three different grounds. Again, the inclusion of tenders or their exclusion has considerable influence on the question.

[Reply to "ENTHUSIAST."]

Working of Rolling-Stock.

Passenger rolling-stock is generally "attached" to principal rolling-stock depôts, in the same way that locomotives are allocated to sheds. It does not follow that a passenger train "originated" in all cases at its depôt station, however, as the working of rolling-stock is on some lines a very complex affair, and coaches may be "diagrammed" away from their depôt station for days at a time.

[Reply to E. S. JONES.]

2-4-0 Great Central Tank Engines.

Doubtless the engine of this type seen by you at Rickmansworth is the one usually employed on motor-train duties in the Aylesbury district, and was probably *en route* to Neasden sheds. Engines of this type were largely used at one time in working the Manchester, South Junction and Altrincham Railway.

[Reply to C. R. HODGSON.]

Fastest Runs, Caledonian Railway.

Next to the 34 min. run of the 4.20 p.m. from Forfar to Perth (32.5 miles at 57.4 m.p.h.), comes a 55.7 m.p.h. "snippet" by the 8.41 p.m. from Forfar to Coupar Angus (16.7 miles in 18 min), and a 54.2 m.p.h. journey over the 39.7 miles from Beattock to Carlisle by the 11.56 a.m. express in 44 min.

[Reply to ALEX W. ANDERSON.]

London, Brighton and South Coast Railway, Epsom Downs Branch.

Distances are as follows:—Sutton to Belmont, 1 mile 9 chains; Belmont to Banstead, 1 mile 35 chains; Banstead to Epsom Downs, 1 mile 38 chains. We do not know how you expect us to answer a query of so vast a scope as the second one you propound.

[Reply to "SUTTONIAN."]

Pneumatic Signalling, London and South Western Railway.

Pneumatic or electro-pneumatic signalling is installed on the London and South Western Railway between Woking and Basingstoke, Grateley and Andover, and at Clapham Junction, and in part of the London district. See RAILWAY YEAR BOOK for fuller particulars.

[Reply to F.H.V.P.]

Light Railways.

Procedure is not altered from that in force when the Light Railway Commission had a separate existence. Therefore the article published in 1915 is still substantially applicable, except that the Light Railway Commission is now associated with the Ministry of Transport.

[Reply to R. MOSELEY.]

Electric Rolling-Stock.

Both the Metropolitan District and Metropolitan Railways have introduced new electric cars with three pairs of double doors equally spaced along each side, as described in last month's number. We agree that this is the best solution of the rush period problem yet available.

[Reply to H. F. BENNETT.]

Zone Tickets.

These may be described as short period local tickets, allowing of unlimited journeys within a specified "zone" or radius, usually within the inner limits of town areas. They were originally issued more or less in competition with local tramway services, and on a weekly basis.

[Reply to "N/C."]

Splitting Distants.

We are not aware as to any definite rule governing the placing of a stop signal over splitting distants. Usually it is placed over the distant for the direct or high speed route; but sighting or other considerations may cause a different position to be adopted.

[Reply to H. A. POPER.]

5.30 p.m. Express ex-King's Cross.

The working of this train has been altered subsequent to the last issue of the North Eastern time-tables, and the York stop does not therefore appear on the sheet time-tables at stations, nor on the arrival and departure tables at York.

[Reply to SIDNEY G. WARD.]

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London and North Western Railway 2-4-0 No. 739.

At one time named *Sutherland*, this engine was re-named *Ostrich*, in view of the title *Duke of Sutherland* having been conferred on an engine of the "Claughton" class. We have not the other information for which you ask.

[Reply to "PRECURSOR."]

The Up "Postal," Caledonian Railway.

Leaving Glasgow (Central) at 6.15 p.m., this train calls at Law Junction (6.46-6.55) to pick up the Aberdeen portion, and at Symington (7.20-7.25) for the Edinburgh portion, being due at Carlisle 8.45 p.m., and London (Euston) 4.7 a.m

[Reply to ALEX W. ANDERSON.]

Great Western Locomotives.

Pipes leading round the boilers of these engines into the safety-valve casing are the feed-pipes, whereby the water is fed from the tender by means of the injectors *via* the top-feed apparatus, into the boiler.

[Reply to "LADY OF QUALITY."]

Cambrian Locomotives.

No. 34 was originally a Metropolitan Railway 4-4-0 tank engine, one of several purchased from that line. They were converted into 4-4-0 tender engines seven or eight years ago, as described in the RAILWAY MAGAZINE at the time.

[Reply to "AYOT."]

North Eastern Railway Locomotives.

On account of their smaller diameter driving wheels, the three-cylinder 4-6-0 engines of Class "S.3" have a greater nominal tractive power than the three-cylinder Class "Z" Atlantics.

[Reply to H. STONE.]

Purple Head Lights.

A purple light is used on the London and South Western Railway, in addition to the ordinary code, to indicate a special or additional train. A black disc with white rim is used by day.

[Reply to F.H.V.P.]

Great Western Railway Locomotives.

We understand that additional 4-6-0 locomotives are on order but none, as far as we are aware, are yet in service. Presumably they will be named as usual when they are completed.

[Reply to J. H. C. MAUNDRELL.]

Single Line Working.

Electric train staff working is in operation on the single line sections of the London and North Western Bletchley to Cambridge line and also between Bedford and Hitchin, Midland Railway.

[Reply to M. G.]

6.25 p.m. ex-Swansea, London and North Western Railway.

This is a through train to Leeds and York, and from Crewe conveys a through North Eastern Railway coach to Newcastle-on-Tyne.

[Reply to E. S. JONES.]

Watford Lines, London & North Western Railway.

We cannot say when the electrification of the Rickmansworth, Croxley Green, St. Albans and Stanmore branches will be undertaken.

[Reply to E. C. B. THORNTON.]

Great Central 60 ft. v. Great Western 70 ft. Stock.

On the average the former is slightly heavier per vehicle. It is, of course, considerably heavier in proportion to the accommodation afforded.

[Reply to J. LEGGETT.]

Electric Rolling-Stock.

London and South Western Railway electric trains have two 275 h.p. motors to each motor coach; the other lines you mention have 250 h.p. motors.

[Reply to E. C. B. THORNTON.]

E. F. B.

These letters indicate "Electric Fouling Bars," so that enginemen may know where to stand and secure protection when occupying a platform line.

[Reply to J. BLOCK].

Railway Revenue.

In the RAILWAY YEAR BOOK you will find full financial information of the kind you require given in respect of every leading British railway.

[Reply to G. H. CLEGG, Jun.]

Midland Railway Canals.

The following canals are owned by the Midland Railway Company:—Ashby, 30 miles; Cromford, 15 miles; and Pinxton, 2 miles.

[Reply to "SINGLE-WHEELER."]

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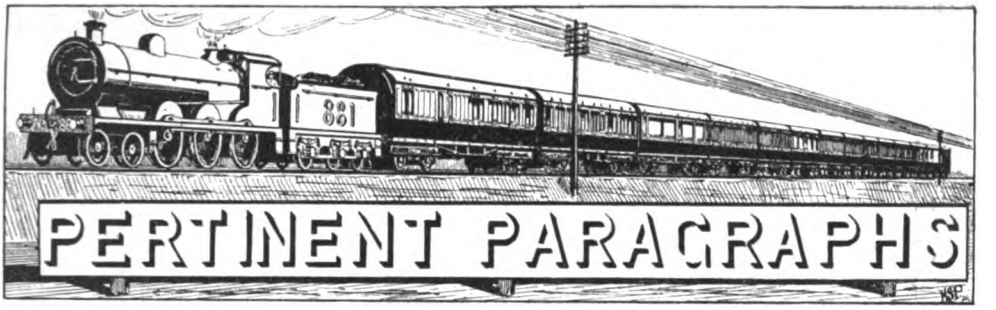

0-6-2 Superheater Tank Engine, Great Northern Railway.

OUR frontispiece this month, from a photograph by Mr. Chas. S. Lake, shows one of the new series of 0-6-2 tank engines recently placed in service in the Great Northern Railway London area by Mr. H. N. Gresley, C.B.E., Locomotive Engineer. Ten of these engines are being constructed at Doncaster, numbered from 1606 onwards, and 50 by the North British Locomotive Company, Limited. One of the latter is illustrated.

These engines differ from their predecessors of the same general class mainly in regard to the boiler, which is equipped with superheating apparatus, and set with its centre-line 8½ in. higher than in the older engines. The cylinders are also larger, and an increase has been made in the tank capacity, while the engine, as a whole, is heavier than those of the ordinary 0-6-2 class. As they are required to work over the widened lines of the Metropolitan Railway between King's Cross and Moorgate Street, these engines are equipped with condensing apparatus.

The cylinders have a diameter of 19 in. and a piston stroke of 26 in. Diameter of the coupled wheels is 5 ft. 8 in. and trailing wheels 3 ft. 8 in. The boiler, which is fed by means of a pump located vertically in front of the tank on the right-hand side, has a diameter of 4 ft. 8 in. and a length of barrel of 10 ft. 1 in. Heating surfaces are as follows: Firebox, 118 sq. ft.; small tubes (107 of 1¾ in. outside diam.), 510 sq. ft.; superheater flues (34 of 4 in, ext. diam.), 370 sq. ft.; total evaporative surface, 998 sq. ft. The superheater is of Mr. Gresley's twin tube pattern with 17 elements each of 1¼ in. (internal) diameter tubes giving a superheating surface of 207 sq. ft., the total heating surface of the boiler with superheater being thus 1,205 sq. ft. Grate area is 19 sq. ft. and a working boiler pressure of 170 lb. per sq. in. is carried. The tank accommodates 2,000 gallons of water, and 4 tons of coal are carried. The engine weighs in working order 70 tons 5 cwt., of which the proportion available for adhesion is 52 tons 15 cwt.

Staff Training on the Great Western Railway.

DURING recent years several railways have introduced systematic training courses designed to produce a staff competent to deal with the difficult problems associated with railway operation under modern conditions, and to raise the general standard of efficiency. Each has its own characteristics, and is designed with a particular end in view, and while some aim only at realising an efficient standard of the staff as a whole, others provide a means whereby a number of men, usually selected by examination, or by recommendation on the basis of past records and achievements, are given thorough training under more or less privileged conditions, receiving at the same time sufficient salaries.

Already responsible for several important measures calculated to produce a competent general staff, the directors of the Great Western Railway are now introducing a scheme whereby a systematic course of training is rendered available. The following are the principal points, as set out by a circular letter issued to the salaried staff by Mr. C. Aldington, C.B.E., General Manager:—

"Candidates for appointment to these courses must be recommended by the Heads of their Departments or by their Divisional or District Officers, to whom application may be made. No application for special training will be considered unless the applicant holds a 'Merit' certificate in the Company's Signalling or Station Accounts Examinations, or has attended one course of lectures and gained a 1st Class certificate at any of the following Institutes at which educational facilities are obtainable by the staff: London School of Economics; Municipal School of Commerce, Birmingham (Railway History and Economics Course only); Technical College, Cardiff; Victoria University, Manchester.

"Candidates recommended will be required to attend before a Selection Committee consisting of the General Manager, the Chief Mechanical Engineer, Chief Engineer, the Chief Goods Manager, and the Superintendent of the Line.

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by the pathetic details of the accident on January 26 and to overlook the fact that it is to a railway company's interest to do everything to avoid risk of disaster, and every accident is a lesson as to the avoidance of repetition. Hence the innumerable safeguarding measures and appliances which figure in railway operating methods and working. And while we do not attempt to deal with the immediate circumstances of this accident it is only fair to recognise the splendid record which attaches to electric train tablet or staff working on single lines. Far from being correct, the statement that on railways "nothing is done for the safety of the public" is quite the reverse of the true facts. Moreover, it is now usual for trains to carry tools and first-aid appliances ready for any emergency which may arise. Speaking generally, and this was the prime factor in the Cambrian disaster, the usual cause is that the human element has failed in some respect. Many special appliances and systems have been devised to avoid this, but it must be remembered that although mechanical and electrical appliances are now well-nigh perfect, and their failures are very insignificant and generally result in the apparatus being inoperable on the safety side, they have their complexities, while railway operation, if too heavily safeguarded, tends to become unworkable under the varying conditions which exist on ordinary traffic lines.

Railway Rolling-Stock on Exhibition.

DURING recent years it has come to be recognised, though even yet not so fully as it should be, that in their rolling-stock and equipment railways possess an invaluable advertising medium. One has only to look back a few years to notice how infrequently locomotives, rolling-stock, trains, stations and signals were utilised for advertising purposes. Yet these are the most obvious characteristics of the railway and its working, and, as evidenced by the steady and increasing support given to the RAILWAY MAGAZINE and its more statistical and historical companion, the RAILWAY YEAR BOOK, there is a very wide public which takes a keen interest in railways on their own account, as well as viewing them as means for travelling and the conveyance of minerals and merchandise.

The tendency now is very different, and engines, vehicles, trains, stations and signals figure prominently in railway publicity. A further aspect has also been added more recently. When one section of the London Electric Railway was brought into use, travelling was made free to anyone on the opening day; during the war, vast sums were realised for war charities by the exhibition of hospital trains: several railways have shown poultry and other demonstration trains; more recently the Great Eastern Railway placed some of their Pullman cars on exhibition; and a few weeks ago the Metropolitan Railway adopted the same policy by inviting the public to inspect at Baker Street station one of the new trains described last month. In the United States, too, the same tendency is evidenced, as we note the exhibition of a pair of new electric locomotives of great size and power by a New York line. We welcome this acknowledgment of the value of publicity in regard to railway material and machinery, as well as in respect of facilities and the attractions of places served by a railway. And the continued adoption of this policy, seeing how important the railway and all that appertains to it is to everyone, is desirable too, in that it is a valuable means of obtaining public confidence as well as of informing all and sundry in regard to new developments and facilities.

Steam Locomotives in Tunnel Service.

ALTHOUGH many of the world's longest and most difficult railway tunnels are now operated by electric locomotives, there will always remain a number through which trains will be worked by steam locomotives. Where length is the difficulty it is not always easy to provide satisfactory ventilation, and instances have been known where enginemen have become partially asphyxiated at times when, owing to an overload or inefficient working of the locomotive, an unusually long time has been occupied in passing through, or they have become "stalled" in transit. It was the practice, in fact, through some of the Alpine tunnels to provide locomotives with air reservoirs on the cab roofs, by which the enginemen could obtain relief when necessary. Somewhat similar difficulties apply in the case of shorter tunnels, especially those for single track, where ventilation is bad and the gradients steep enough to call for hard engine working under the most adverse conditions.

On a portion of the Southern Railway, U.S.A., there are several tunnels—not necessarily of great length—which are exceedingly hot and stifling when hard engine work is done, and when very large 2-10-2 locomotives were introduced to work the heavy freight traffic it was found that at times the crews were nearly asphyxiated, and during the hot weather conditions became almost intolerable. To afford a remedy, the engines have been fitted with a smoke conduit above the boiler, extending from the chimney to an outlet over the tender and behind the cab. At the chimney a hinged bonnet is fitted, which is moved forward to clear the outlet when the engine

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is working in the open, but, on entering one of the tunnels concerned, it is drawn back by a compressed air device so as to complete a through conduit carrying the exhaust gases and steam clear of the engine and behind the enginemen. The wear and tear upon the conduit with engines of so powerful a type is, of course, very great, but the time during which it is used is relatively very short, and it is sufficient to make the conduit of suitable strength.

As a further aid to the comfort of the enginemen and to prevent exhaust gases coming forward again and so entering the cab as a result of tunnel draught, small rotary blowers are installed beneath the footplate on each side of the engine. These collect air from just above rail level and deliver it into the cab adjacent to the driver and fireman. It is stated that the special ventilation for the cab thus provided is so far appreciated that the blowers are frequently kept running continuously during hot weather.

Training Electric Railwaymen.

For several years the associated "Underground" companies have adopted systematic training courses foı motor-omnibus drivers and conductors, including the use of the film as an instructive medium, and this has now been extended to cover the training of men employed on the electric tube and underground lines. At the 36th operating department efficiency meeting held recently at the Training School, Milman's Street, Chelsea, S.W., Mr. E. Yorke, Inspector of Employment and Training (Railways), read a paper entitled "The Employment and Training of Railwaymen," illustrated by a new film used for instruction purposes. Mr. H. E. Blain, C.B.E., Assistant Managing Director, presided over a large gathering, and was supported by Mr. S. J. Webb, Passenger Agent, Mr. J. P. Thomas, Assistant Operating Manager, Mr. J. Thornton, Superintendent of the Line, and other officers. Among the visitors present were :—Mr. C. J. Selway, Superintendent of the Line, G.N.R. ; Mr. F. C. A. Coventry, Assistant Superintendent of the Line, G.W.R.; Mr. L. D. Parsons, Assistant to the Superintendent of the Line, L. and N.W.R. ; Mr. E. Rendell, Divisional Superintendent's office, G.W.R. ; Mr. John Forbes, Assistant Superintendent of the Line, L.B. and S.C.R. ; Mr. H. E. O. Wheeler, Assistant Superintendent of the Line, S.E. and C.R. ; Mr. F. Bushrod, Assistant Superintendent of the Line, L. and S.W.R. ; Mr. H. Wheeler, Secretary of the Negotiating Committee of General Managers.

Mr. Yorke explained the reason for the inauguration of the training centre for railway employees at Lambeth North and described the methods whereby each grade was trained in specific duties and also educated for promotion. The film, which was most instructive, demonstrated the possibility of utilising this medium to advantage in training railwaymen and others, and there can be little doubt that the future will witness considerable development in this method of instruction.

The Film as a Training Medium.

The chief theme of the new railway education film is that two men on the look-out for a job approach an old "Underground" man and are referred by him to Electric Railway House, whence they are directed to the new Railway Training Centre at Lambeth North.

Several interesting slides were shown of the Training Centre, which comprises an office for the school staff, a medical officer's room, lecture hall, booking office school and motor school, all of which are suitably equipped, the cinema being utilised at several stages. On the arrival of the men at Lambeth they are examined for sight, height, &c., and after filling in the usual application forms, are taken on as porters. Even for such work a certain amount of training is essential, and they are taught how best to perform their duties and also the precautions to take in connection with traffic working and to safeguard the public. A number of "scenes" were filmed to show how inattention to the regulations usually ended in inconvenience (if not mishap) to someone or other. The subsequent progress of these two men up to the grade of motorman shows in detail the various means taken to safeguard the working of trains, and forcibly illustrates how delays and inconvenience are caused through loose working. The method of train examination before it proceeds in service each day was well shown, and it was remarked that careful attention had to be paid to this examination.

After the main film a short film dealing with the press inspection of the new District rolling-stock at Ealing Broadway was shown. The discussion on the paper was opened by Mr. G. P. Barnett, Road Superintendent, London General Omnibus Company, Messrs. J. Goole and J. Hodge, Chief Inspectors (Railways), and continued by others.

With the Prince of Wales in Victoria.

We have already illustrated and described the train used by H.R.H. the Prince of Wales when travelling in New South Wales. In Victoria, too, when the Prince visited Geelong, Ballarat and Bendigo a special train was made up. This train was lent to the South Australian Railways during the visit of the Prince to that State, for travelling over 5-ft. 3-in. gauge lines.

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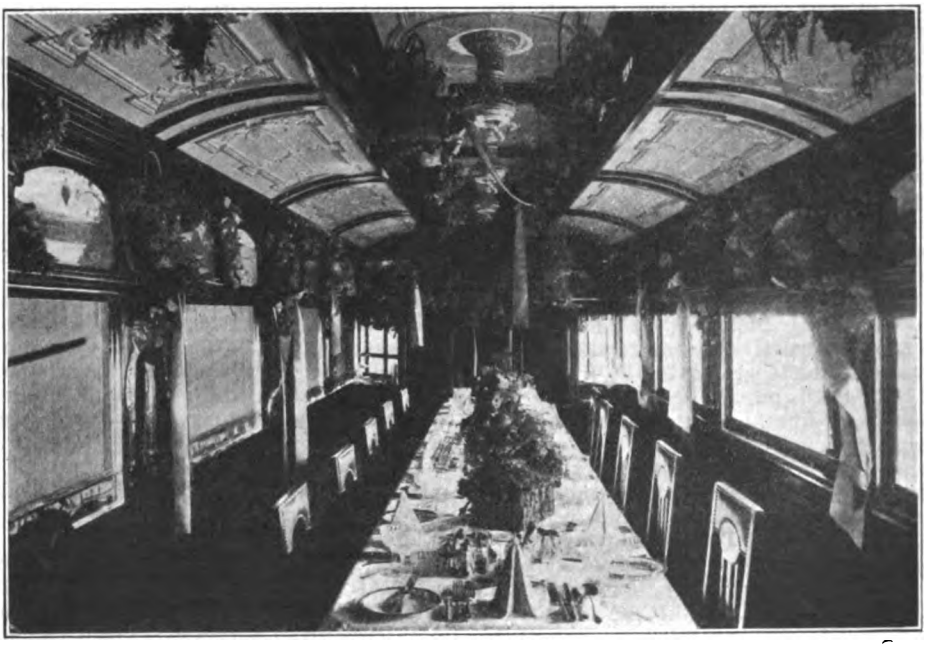
The train consisted of 1 express brake van, 2 first-class express corridor carriages, 1 dining car and 3 saloons. The dining car, which is divided into first-class dining compartment, kitchen, and second-class dining compartment, was so arranged that the fittings in the second-class portion were removed and a longitudinal table put in the centre with chairs round sufficient for 11 distinguished visitors. The first-class portion was kept as usual, and was used by the staff. The catering was carried out by the Railway Refreshment Services Branch.

The Prince's saloon was attached to the rear of the train, which enabled him to make full use of the observation platform on the car. The saloon was provided with electric lighting and heating, lavatories, baths, sleeping apartments, lounge and attendants' quarters. Telephonic communication was installed, so that the engine driver could be communicated with if necessary. The train was drawn by an "A 2" class 4-6-0, locomotive of a class recently constructed at the Newport locomotive workshops of the Victorian Railways. The engine was painted the usual brown and decorated with the Prince of Wales' feathers, as illustrated last month. The Royal train was preceded by a pilot train and the line patrolled every half mile. For the photographs reproduced in our last issue and on this page, we are indebted to Mr. A. E. Smith, Chief Mechanical Engineer.



VICTORIAN GOVERNMENT RAILWAYS.
Interior of Dining Car of train used by H.R.H. the Prince of Wales.

Railway Architecture.

In the pages of the *Architects' Journal* one "Aero" recently contributed what he described as an "Architectural Causerie" on railway practice, and somewhat remarkably, he managed to consider the architecture of railway stations without mentioning Charing Cross and its famous bridge, or condemning King's Cross on account of its plain exterior. Indeed, many of his comments are quite interesting and certain of his remarks concerning early days are worth quotation. Thus, speaking of the work of Philip Hardwick, who "enjoyed the lion's share of the special railway work then going," he writes :—" Philip Hardwick could scheme the arrangement of the tunnels in London and Birmingham, provide for the fearsome tunnel entrance on the London side of Primrose Hill and the pleasant one at the Kilburn end ; he or his assistants could dash off sketches for the stations at Watford, Boxmoor and Tring, some portion of which remain as they were left in 1839. With facility the talented Hardwick conceived the round house for the engines at Chalk Farm—now a bonded store for wine—inspired thereto by his father's measured drawings of the Pantheon at Rome, or he could give his attention to the railway

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village at Tring, headed by the station-master's house."

"Artistic" Railway Termini.

PROCEEDING to consider the general trend of railway station architecture, the writer provides a review which is worthy of quotation as follows:—"Hardwick had no sooner established his reputation as an expert for railway accessories, when Mocatta produced his Italian renderings for the terminal at London Bridge. Then came Dobson's opportunity at Newcastle, Lancton Wood's masterpiece at Kingsbridge for the Great Southern and Western of Ireland, and Mulvany's granite monument at Broadstone. At this period more importance was attached to the architectural character of a railroad station than to the rolling-stock, particularly the designs of passenger coaches, the latter to all intents and purposes reproducing features familiar to the stage-coach and post-chaise. Even the designers of locomotives studied classic mouldings in order to give a Doric finish to a funnel. In Paris Hittorff was busy translating his Sicilian researches into terms of superposed Doric for the grandiose front of the Gare du Nord. The extravagance of this architect, although the result delighted the promoters, among whom were the Rothschilds, delayed for some years the construction of the line beyond Compiégne and caused the rolling-stock to become a reproach. We can forgive this architect for his dreaming, does not the main front of the Gare du Nord rank among the good things of the railway age?"

"Finally we come to the period when Sir William Tate was called upon to design railway stations in France between Havre and Paris, followed by the building of King's Cross Station in London in 1854, and 16 years' later by the realisation of Sir Gilbert Scott's Gothic romance at St. Pancras, and the chain of Gothic stations between London and Leicester. This was in the seventies. Previously Lancton Wood had determined upon Italian for the style of the stations between Derby and Manchester."

The Architecture of the Signal Box.

"AERO" penned his "causerie" while travelling in company with Mr. Dewhurst, of the Great Southern and Western Railway of Ireland, who appears to have directed his attention to certain minor features of railway architecture—roadside stations and the signal boxes in particular. The opinion is therefore expressed that country stations could be improved, both in plan and conventional treatment. "Why, for instance, should the pattern of Clapham Junction be taken as a type suitable for Broad Clyst, or the Halt at Shuntford-cum-Buffer assume the swagger of a suburban station? Mr. Dewhurst was eloquent regarding the design of the modern signal-box. He opined that, although the general proportions of the ordinary signal-box might pass muster, the introduction of finials as well as the inordinate desire for plate glass, no less than the colour of the paint, left much to be desired. Mr. Dewhurst has built many signal-boxes in Ireland, and he informed me that he invariably introduced sash-bars, it being found in practice that the signalmen did not object provided that the quarries were of reasonable size."

"Aero" concludes his interesting chit-chat by some remarks concerning the general work of the railway architect. "Now there is a great deal of study required to become a railway architect, and it is a specialised branch of practice demanding a high standard of education. The railway expert must understand gradients, excavating, drainage, surveying, in fact, all the branches of engineering. Should the exigencies of the railroad demand a good viaduct he must be ready with ideas for suitable construction, designed, moreover, to preserve the amenities of the landscape. Brunel was one of the greatest railway engineers of his day, but he never sanctioned a crude design for a bridge or station. It is a custom in these days, particularly true of the leading railway companies in the United Kingdom, to have an architect attached as an assistant to the railway engineer. The position of such an expert attached to another expert who may hold different opinions may be an onerous one. The public appreciate improvements, and are quick to note examples of good taste. With the proposed electrification of the main trunk lines many changes are foreshadowed, therefore, a rare opportunity awaits the young architect with a bent towards railway practice.".

The Revolt of the Passenger.

IN a recent issue of the *Daily Telegraph* an editorial appeared under this heading part of which, with allowance for a pardonable degree of newspaper elaboration and a touch of humour, is worth repeating:—"A young man of Rovigo wished to catch the express from Venice at that town. The exploit in itself does not seem difficult, but the young man put his luggage in the cloak room and the functionary in charge was unable to find it on demand, and was still engaged in the search when the express steamed into the station. The young man of Rovigo thereupon drew a revolver and threatened to shoot the engine-driver if the train left before he gave the word for it to do so. We cannot sufficiently sympathise with the feelings of the engine-driver. Passengers who complain that a train does not start are frequent and familiar objects,

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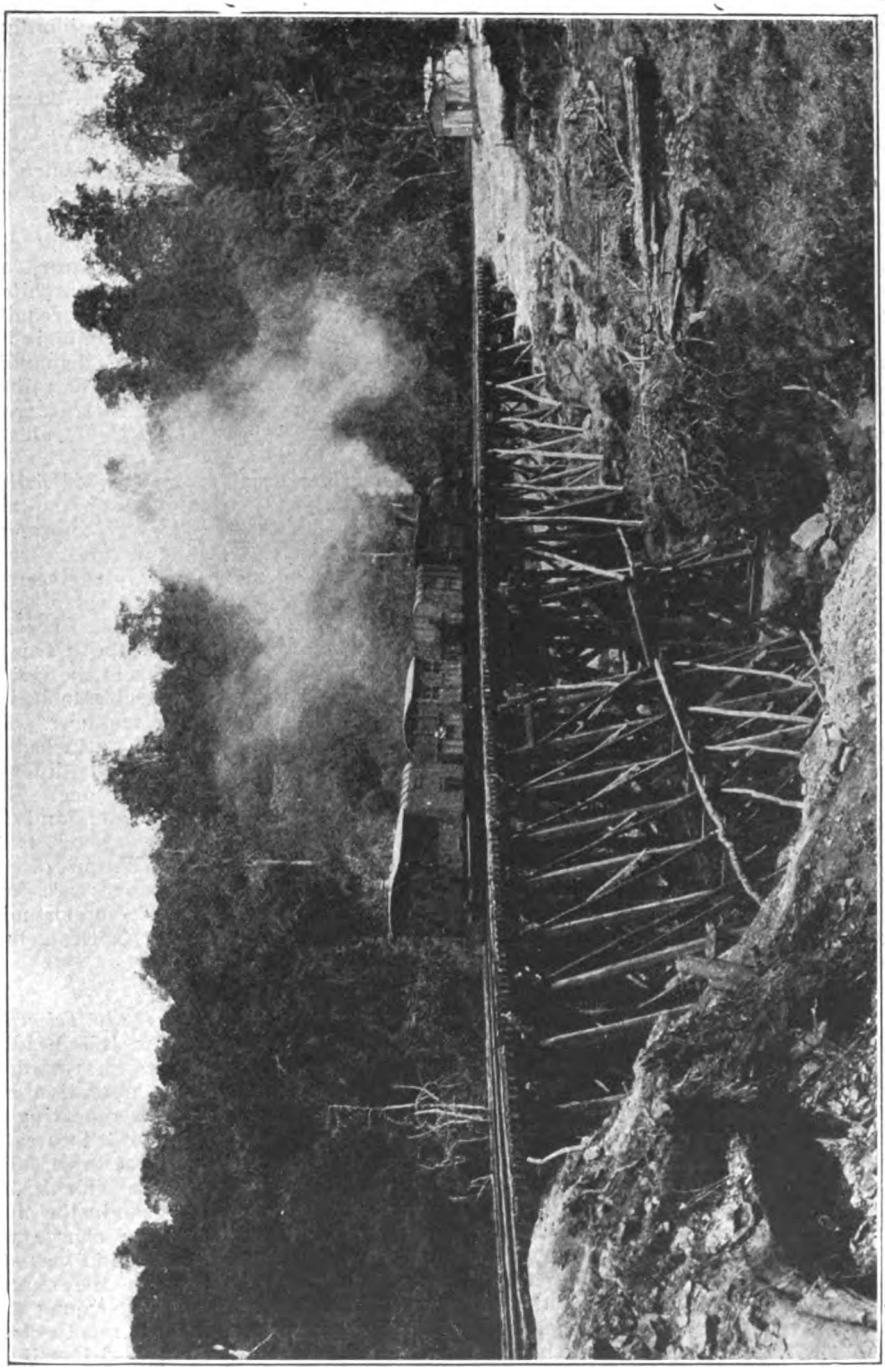

TEMPORARY VIADUCT ON THE MAU ESCARPMENT, UGANDA RAILWAY.

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but a passenger who threatens violence if a train does start must seem an incarnate contradiction of the laws of nature. While the engine-driver still reeled from the shock the cloak-room man found the luggage, the young man climbed into the train with his bag and the train rolled on.

"But the railway officials, collecting their scattered wits, saw that if this sort of thing was allowed anything might happen. Passengers might even come to think that trains were run for them to use. They telegraphed to Ferrara, the next stop, to arrest the young man of Rovigo. He is quite a modern young man. He understands that without propaganda revolvers are useless, and he spent his time in persuading the other passengers that his cause was theirs. So when authority appeared on the Ferrara platform and haled him out of his carriage the other people in the train refused to allow it to go on without him. Each time it started somebody pulled the alarm cord and we pause to drop a passing tear over the emotions of the engine-driver. At last authority collapsed, the young man of Rovigo returned to the train amid the cheers of the crowd and it resumed its headlong course. Such is the history of the first successful revolt of the passenger."

Heavy Construction on the Uganda Railway.

GREAT difficulties were encountered in the building of the Uganda Railway owing to the irregularity of the ground. In the "Plain" section, miles 0 to 325, there are some 630 bridges and other openings, an average of about two per mile. Of these there are about 70 with plate girder spans, varying in length from 6 to 100 ft. Major bridges exist at the Tsavo (miles, 131½), Darajani (miles, 174½), Kifaru (miles 218½), Stoney Athi (miles, 299), and Athi (miles, 309½) Rivers. The bridges at the Tsavo and Stoney Athi Rivers consist of 4 plate girder spans of 60 ft., resting on masonry piers and abutments, that at Darajani has 5 spans of 40 ft. resting on steel cylinders, that at Kifaru has 4 spans of 40 ft. on cylinders, while that at the Athi consists of a single triangulated span of 100 ft. with two plate girder spans of 40 ft. on masonry piers and abutments.

In the "Hill" section, miles 325 to 587, there are 35 bridges with plate girders of from 10 to 100 ft. spans on either concrete piers and abutments or upon steel cylinders. The largest is that spanning the Morendat River (miles, 394), which consists of one triangulated span of 100 ft. and two plate girder spans of 20 ft. on screw piles and concrete abutments. On this section, which represented the heaviest work on the line, there are 35 viaducts and a tunnel (at miles, 526) about 170 yards in length. The viaducts are all of the same type and consist of four-legged trestles splayed at a batter of 1 in 6. The legs of the trestles are built up of H irons braced together, carrying 20 ft. girders. Between each pair of trestles or between a trestle and an abutment rests a 40 ft. plate girder. In all there are 250 spans of 40 and 235 spans of 20 ft., representing a total of about 4,900 lineal yards of viaduct work. On the descent from the Mau into the valley of the Nyando River, 18 viaducts had to be erected, and the illustration on the opposite page gives a good idea of the difficulties which were surmounted.

Train Accelerations on the London, Brighton & South Coast Railway.

WHEN the "Southern Belle" expresses were recently accelerated to their pre-war time of 60 min, between Victoria and Brighton, complaint was made in some quarters that business travellers were not given corresponding advantages. It may be pointed out that these trains run at times when the full pressure of ordinary traffic is not operative, but the train improvements which came into force on February 7 remove any such reproach, in so far as it may have been justified. There are now 60-min. business expresses from both London Bridge and Victoria to Brighton, the former at 5 p.m. (except Saturdays) and the latter at 6.35 p.m., while the 5.35 p.m. from Victoria takes only 5 min. longer. In the up direction, the 8.45 a.m. from Brighton is allowed 62 min. to London Bridge. Brighton also gets several new trains, at 1 p.m. from Victoria, 2.5 p.m. from London Bridge, at 8.57 and 9.45 a.m. from Brighton to Victoria, and 10 a.m. from Brighton to London Bridge, all in good express times. The Eastbourne route obtains an additional 90-min. train, the 5.5 p.m. from London Bridge being once more given that time. The 5.20 p.m. from Victoria becomes a 91-min. train, while the new 6.40 p.m. from Victoria is due in 93 min. Besides these outstanding improvements, Worthing, Seaford and Hastings have associated accelerations and improved facilities. We view these accelerations and additional facilities as an indication that during the present year there will be a distinct step forward towards a return to pre-war standards of express train schedules, and the Brighton Company are to be congratulated on thus leading the way at so early a date.

Railway Absurdities of Literary Men.

FOR some unexplainable reason, so many authors and writers, including newspaper men as well as novelists and the like, while they profess to be familiar with life in all its phases, are exceedingly prone to pen

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absurdities when referring to railways. We are not concerned with inaccuracies of the more technical kind, for these can be forgiven, but the railway is so much a matter of everyday life that one would expect the elementary and obvious facts to be understood. Examples of railway absurdities, published by writers of note as well as by the anonymous scribes of the ordinary Press, have many times been referred to in these pages, but in this connection we may quote from one of our regular correspondents as follows :—

"Some authors are so anxious to throw picturesque touches into their writings that they sometimes stumble into very elementary inaccuracies. Mr. Arnold Bennett has just brought out a new book of chit-chat called 'Things that have interested me,' composed of short articles, mostly criticisms. One of the articles is called 'At the Quai D'Orsay Terminus, Paris.' Mr. Arnold Bennett is apparently drinking tea on the *terrasse* of the café in the upper part of the station. He remarks that '*faint clouds of steam rose occasionally from below*!' Probably Mr. Arnold Bennett was too occupied in watching the peculiarities of other people to notice that no *steam* locomotive ever came even within sight of the station, as all trains are drawn by electric locomotives from the old Orleans terminus at the Quai d'Austerlitz along the extension of a kilometre or two to the new terminus of which he was writing!"

Railways in the Dutch East Indies.

RELATIVELY very little is known in this country concerning the railways of the Dutch East Indies, and therefore we welcome an article published by the *Netherlands Indies Review* on this subject. Sumatra produces nearly one-fifth of the world's tea, and a large portion of its rubber and tobacco; but there are only about 300 miles of standard gauge railway and some 350 miles of 2ft. 6 in. gauge lines. Work is in hand, however, on another 300 miles, with a ten-year programme which will add nearly 2,000 miles, linking up the various sections of the island. In Dutch Borneo, though the area is about equal to that of the late German Empire, there are, as yet, no railways, but this reproach will be remedied by the new work to be undertaken, which includes a coast line from Pontianak to Sambas, approximately 150 miles. The Celebes Peninsula contains only a steam tramway, but 123 kilometres are to be added.

Our contemporary then explains that the "tramways" are really local railways, classified according to the speed at which trains travel. Thus some of them are quite long concerns, though they come under the tramway designation, the Samarang-Cheribon and the Goendih-Sourabaye systems being respectively 384 and 225 kilometres in length. The steam trams may consist of a 50-ton locomotive engine, hauling half-a-dozen or so 12-ton carriages, and in some instances "trams" use both railways and tramways, obeying the speed restrictions of the latter when travelling thereon. In Java and the neighbouring island of Madura there are some 1,500 miles of these tramways.

Throughout the whole of the Dutch East Indies, there is scope for great railway development, and emphasis is laid by our contemporary upon the urgent need for British manufacturers to obtain a good share of the business thus represented, which at present appears rather to tend towards being acquired by German and United States firms.

The Worth Valley Line, Midland Railway.

THE short Midland branch from Keighley up the Worth Valley to Oxenhope was at one time thought to be a line offering great possibilities. It may eventually prove so, but this is very doubtful, owing to the rapid development of road traffic. Though the line is single, it has always been a profitable one, as shown by its relatively frequent train service, but especially 20 years ago, when trade in the valley was very prosperous. The district is hilly, but the average gradient is not more than 1 in 70, and the tunnels only measure 250 yards.

At Oxenhope the railhead is barely 7 miles from Hebden Bridge on the Lancashire & Yorkshire Railway main line, between Leeds and Manchester. At present the distance by rail is 24 miles, and the journey involves at least three changes and the use of three companies' lines. This connection was at one time proposed, and, if carried out, would present no great difficulties. No tunnel would be necessary, as a deep valley cleaves the ridge between the two places, and the steepest gradient would not be more than 1 in 60, and that for a short distance only. When first mooted the work could have been done cheaply, but to-day the water rights of Halifax and Bradford complicate the situation, since this region is a gathering ground for two of their reservoirs. In these days little is heard of the project, and, as a first-class road links up the two places, motor traffic is growing.

Another useful proposal is that of joining up with the East Lancashire railways, from the Worth Valley line near Oakworth. This connecting link was actually surveyed and some of the posts are to be seen to this day. The proposed line was to follow up the real Worth Valley (there is much con-

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fusion in the district as to which stream really *is* the Worth) to its head, and then to pass into Lancashire through the cleft in the ridge which divides Yorkshire from Lancashire. It is doubtful if a tunnel would be necessary, but boggy land on the Lancashire side would have given trouble. A connection near Colne would have completed an alternative route for the Midland-East Lancashire expresses, which now go via Manchester.

The cost of the line when first suggested would not have been great, as labour was cheap and most of the land to be had at low rates. To-day the water rights of Keighley would complicate matters, and, in view of the present cost of labour and materials, this connection is hardly likely to be realised for years to come. Traffic over this route would be considerable, for normally there is much trade between Leeds, Bradford and Keighley and the East Lancashire towns such as Burnley, Nelson and Colne. There would be a saving in distance, and also an avoidance of the congestion which exists on the route now used, via the Lancashire & Yorkshire Railway through Halifax, Sowerby Bridge and Todmorden. If either or both of these projects should materialise, the present Worth Valley line would have to be made a double one, but that should present no great difficulties, in spite of the tendency for some of the embankment to slip.

Railway Practice in South Africa.

A FEW weeks ago Mr. Alfred E. Snape, M.Sc., A.M.Inst.C.E., F.R.San.I., Professor of Civil Engineering in the University of Cape Town, delivered a lecture on this subject before the Manchester University Engineering Society, and his remarks may be regarded as a corollary to those of Mr. A. H. Tatlow quoted last month.

Railway construction in South Africa dates back to 1859, when two sections in different places were commenced. The parent line of the present railway system is the line from Cape Town to Wellington—a distance of 63 miles—and its branch to the suburb of Wynberg, 8 miles from Cape Town. The other line was merely a short local line of 2 miles leading from the Point, where the docks are, to Durban. Both were constructed by joint stock companies and both were to the standard gauge, 4ft. 8½ in. The main railway system in the Union is founded upon reaching these two towns. It must always be remembered that the main part of the interior of South Africa is a large plateau, with an average height of over 4,000 ft. above sea level; the altitude of Johannesburg is about 5,500 ft. And all round the coastal belt are ranges of mountains which have to be surmounted by the railways from the ports before the interior is reached.

In 1872 the Cape Colony received responsible government and all its financial affairs were henceforth administered by its own Parliament. The company owning the Cape Town-Wellington line was in financial difficulties owing to the very heavy capital expenditure which had been incurred upon its construction—£13,670 a mile. Kimberley had grown rapidly and the country generally was experiencing prosperity. One of the first questions to be faced by the new Parliament was the most important one to a young country, that of railway development. The decision was made to buy out the existing company and to work this and all new lines as State railways, a decision which has never since been regretted in South Africa. A comprehensive scheme for new railways of a total length of 895 miles was passed in the two years 1873 and 1874. It was found impossible for the Colony to bear the heavy capital expenditure on the new lines which had been expended on the Cape Town-Wellington line, especially as the passes had still to be ascended.

Cost of Construction.

SIR CHARLES GREGORY, later President of the Institution of Civil Engineers, was the consulting engineer in London, and, after taking his and other technical advice, it was decided to make the gauge of all the new railways 3 ft. 6 in. and to work the existing length with three rails instead of having a break of gauge. This allowed very sharp curves to be built; 5 chains, or 330 ft. being decided upon as the minimum radius. Steep gradients and light rails also cheapened the cost. The maximum grade was 1 in 40, uncompensated, or 2½ per cent., and as steel rails were just then coming on the market, iron rails were generally used with steel rails on curves of less than 660 ft. radius, and gradients steeper than 1 in 70, both iron and steel rails being of section 45 lb. to a yard. With their then outlook and with many years of financial stress which later ensued, the Cape Government were wise in coming to that decision. They built these railways right into the interior plateau for £8,843 a mile, as against £13,670 a mile for the standard gauge on the Cape Town-Wellington Railway. Mr. Mansergh D. Robinson, M.Inst.C.E., New Construction Engineer on the South African railways, estimated that the standard gauge would have cost at least one-third more, or nearly five million sterling, which would have meant severe deficits, with a consequence that railway development in the country would have been considerably retarded.

In developing a new country the important factor is to get the main railway system in

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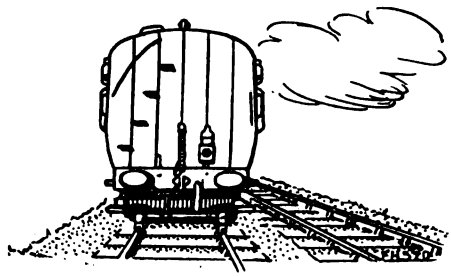
running order with the cheapest possible lines. When traffic grows and the country becomes more developed re-grading and easing the curvature can then take place, and the heavier traffic then expected can pay for these improvements. The important thing at first is to get the railways at the cheapest possible cost, even if the trains can only run at 15 m.p.h. This policy has been adopted, and the average cost of railways built within the last 10 years, including some heavy mountain sections, is under £4,000 a mile. The very heavy increase in the mineral traffic, especially coal, since the outbreak of the Great War has necessitated heavy re-grading on the main lines. The Union is saved any expenditure on land, except in the special cases of developed land or land in towns. By the general law, a strip 100 ft. wide, with additional width for sidings and stations, has to be given by the owner for the railway, if in the Transvaal, Natal or Orange Free State; in the Cape, 66 ft. is the general width laid down. There are no difficulties over this, as every farmer wants a railway through his farm, the value of his land being so much enhanced thereby.

Railway Shareholders and the Future of Home Railways.

THE Minister of Transport recently received a deputation from the Central Council of Railway Stockholders' Associations. The objections of the Council to certain features of the Government scheme were fully pointed out by Mr. W. F. Russell (Chairman of the Central Council), Sir Charles Wakefield, Bart. (Chairman of the English Stockholders' Association), and other speakers, who claimed that by statutory right, and as a matter of fair dealing, the railways should be returned to their owners in the same condition of earning capacity as they were in 1913. The Council voiced the view that (1) the basic net revenue should be higher than in 1913, having regard to the increase since then in the general rate of interest; and (2) the State should not share in surplus revenue, though they recognised the right of the traders to some share in any surplus profits which should hereafter emerge.

On the question of grouping, the Council urged on the Minister the alternative scheme of grouping suggested by the Railway Companies' Association, and pointed out the serious effect upon the Scottish companies of isolating them in a group by themselves. With regard to the Irish railways, it was urged that their financial equilibrium should also be restored before the railways were handed back, and that they should be dealt with at the same time as the other railways. The Council strongly urged on the Minister that, as apparently normal conditions could not be reached before the end of the period of control, and as that condition of matters was in their view due to the policy of the Government, the guarantee should be continued till such time as all necessary steps could be taken to enable the companies to return to normal working. The Council in conclusion pointed out the serious effect that a financial crisis on the railways would have, not only upon the railways themselves, but upon the general credit of the country.

The Minister, in reply, pointed out that, as the deputation would appreciate, several of the points raised by them were matters on which he could not give a definite reply. They were under the consideration of the Government and were the subject of discussion with the companies. He realised, however, that in the interests of all connected with the railways the uncertainty of the present situation should be cleared up as early as possible, and the introduction of the Bill dealing with the future of the railways, which he hoped would take place at an early date, would have this effect.



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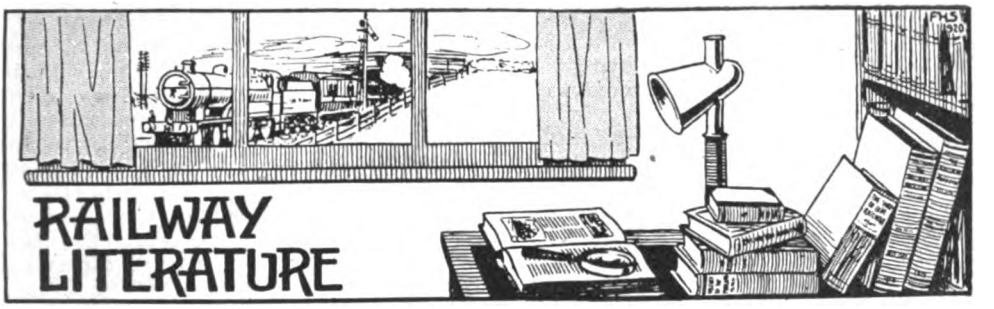

THE LAW OF TRANSPORT BY RAILWAY. By Alan Leslie, B.A., LL.M. [Sweet and Maxwell, Limited, 3, Chancery Lane, W.C.2. Two guineas net.]

A useful addition to the various works dealing with legal aspects of railway incorporation, operation and the "sale of transport," which, moreover, possesses certain original features in scope and treatment. It is well arranged, with clear divisions between the sections. The large number of cases cited are suitably indexed in 86 pages of the work, whilst the table of statutes comprises 16 pages. Starting with the railways and the Common Law, Section II discusses the history of Common Carrier's Liability, while later sections consider the Common Carrier at Common Law, and the Rights and Duties Incidental to Contracts for the Carriage of Goods. Other sections deal with the carriage of animals, mails, parcels, explosive and dangerous goods, and passengers' luggage, while there is a well-written section dealing with maximum rates and charges—a matter of considerable moment at the present time. The publication and disintegration of rates is discussed at some length in Section 13, where the provisions of the various Acts authorising the increase of rates are ably reviewed.

LOCOMOTIVE UP-TO-DATE. By Charles McShane. [Price $5·00. Griffin & Winters, New York Life Building, Chicago, Ill.] Originally published more than 20 years ago, this well-known work is re-issued in a revised and up-to-date form, including particulars of new designs of fittings and appliances, &c., which have been incorporated into recent locomotive practice. For the most part description is technical, illustrated by drawings, and the purview is, of course, American. As a collection of technical data and much useful practical information this work is to be commended.

OPENINGS FOR BRITISH WOMEN IN CANADA. By Florence B. Low. [William Stevens, Limited, Henrietta Street, W.C.2. Price 2s. net.]

A handy booklet, gives essential information as to the openings for women in Canada, qualifications and conditions of life and employment. An attractive series of illustrations, several of railway application, and a map add interest to a useful volume.

THE PORT OF SWANSEA. We have received from Mr. P. W. Phillips, General Manager of the Swansea Harbour Trust, a copy of the 1921 Handbook of tides, rates and dock facilities. It is well-produced, freely illustrated, and contains a great deal of useful information in regard to the trade and facilities of the port.

RAILWAY STATISTICS OF THE UNITED STATES OF AMERICA, 1919. By Slason Thompson, Bureau of Railway News and Statistics, Chicago, Ill., U.S.A. These annual volumes, of which the present issue is the seventeenth, while not bulky, contain a great deal of useful information concisely stated. The main portion relates to the railways of the United States, but an important section collects data concerning railways of other countries, which is thus made available for comparison and reference.

BRITISH RAILWAYS AND THE GREAT WAR. By E. A. Pratt. [Selwin and Blount, Limited. In 10 fortnightly parts. Price, 3*s*. 6*d*. net.]

Mr. Pratt is so well-known as a writer on railway economic and operating topics, that he needs no introduction to readers of the RAILWAY MAGAZINE. This serial work is, however, of value quite apart from the personality of the author, except in so far as that indicates thoroughness and trustworthiness, and in view of the fact that Mr. Pratt has been given the special facilities required for the production of an authoritative work on this subject, readers will be well advised to purchase copies. Part I now issued is concerned with introductory aspects, including pre-war measures in England designed to meet war eventualities should they occur, and which, in the outcome, proved of so great initial value; the War Council and the work of the Railway Executive Committee; the application of the Act of 1871; financial arrangements, &c. In general aspects the position of the home

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railways during the war is known to our readers, and the broad facts of the tremendous and unique services rendered to the nation have been fully reviewed in these pages. But Mr. Pratt goes more fully into these and associated matters, besides bringing out many facts which are less widely known, and even the student who has studied the subject will find much that is new to him. The full story constitutes, besides, entrancing reading, and whether from the point of reference value and instructive information, or of general interest, this work may be commended. Portraits, plans, diagrams and photographic illustrations are generously included.

ELECTRIFICATION OF RAILWAYS. By H. F. Trewman, M.A. (Sir Isaac Pitman & Sons, Ltd. Price 2s. 6d. net). The author, who is Chief Instructor at the Woolwich Electrical Engineering Ordnance College, describes this volume as an outcome of the ever-increasing discussions in engineering circles as to the advisability or otherwise of electrifying main line and suburban railways in Great Britain, in conjunction with the need for relieving congestion and utilising fuel in a more economical manner. He does not go into elaborate technical detail, attention being directed to the main issues, electrical, traffic and economic. The volume is, in fact, concerned mainly with the more commercial aspects, as compared with the severely technical, on the basis of British railway conditions, so that this study should be one of real usefulness. The subject is discussed quite fairly and reasonably.

BELTS FOR POWER TRANSMISSION. By W. G. Dunkley (Sir Isaac Pitman & Sons, Ltd. Price 2s. 6d. net). This is another addition to Pitman's Technical Primer series. It is described as a systematic treatment of belt materials and types of belts, and of the transmission of power by belting, with a series of specially calculated tables.

RAILWAYS AND SUPERANNUATION FUNDS.

SINCE the signing of the Armistice in November, 1918, much has been done in many directions to supplement the superannuation allowances of retired railway officers and clerks. It is difficult to-day to realise that railways had long passed the first blush of youth before such funds were established at all.

They mostly began in the seventies of the last century Mr. Joseph Tatlow, in his illuminating biography* "Fifty Years of Railway Life in England, Scotland and Ireland," tells the story of their inauguration. He remarks :—

Another matter which concerned, not so much the public as the welfare of the clerical staff of the railways, was the establishment of superannuation funds; yet the public was interested too, for the interests of the railway service and the general community are closely interwoven.. Up till now, stationmasters and clerks had struggled on without prospect of any provision for their old age. Their pay was barely sufficient to enable them to maintain a respectable position in life and afforded no margin for providing for the future.

At last, the principal railway companies, with the consent of their shareholders, and with Parliamentary sanction, established superannuation funds, which ever since have brought comfort and security to the officers and clerical staff, and have proved of benefit to the companies themselves. A pension encourages earlier retirement from work, quickens promotion, and vitalises the whole service. On nearly all railways retirement is optional at sixty and compulsory at sixty-five.

The London and North Western Railway was the first company to adopt the system of superannuation, the London and South Western second, the Great Western came third, the Midland fourth, and other companies followed in their wake.

In 1873, the Railway Clearing House obtained Parliamentary power to form a fund for its staff, with permission to railway companies not large enough to successfully run funds of their own, and also to the Irish Railway Clearing House, to become partners in this fund. The Irish Clearing House took advantage of this, as also have many railway companies, and practically the whole of the clerical staff throughout the United Kingdom, can to-day look forward to the benefits of superannuation

* In stock at the RAILWAY MAGAZINE Offices. Price 10s.; by post, 10s. 9d.

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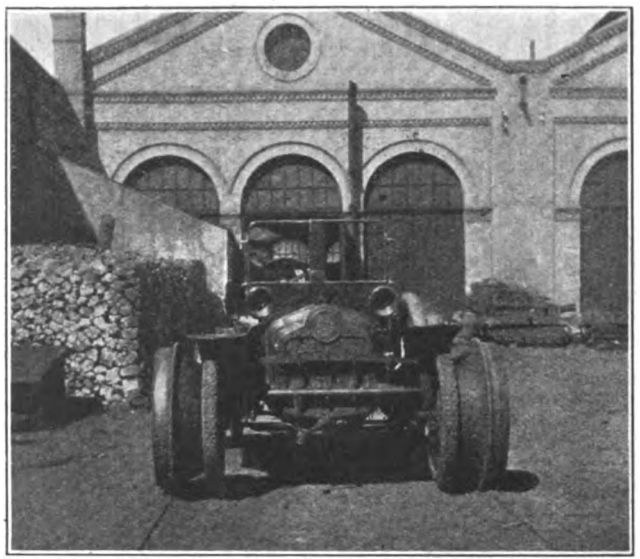
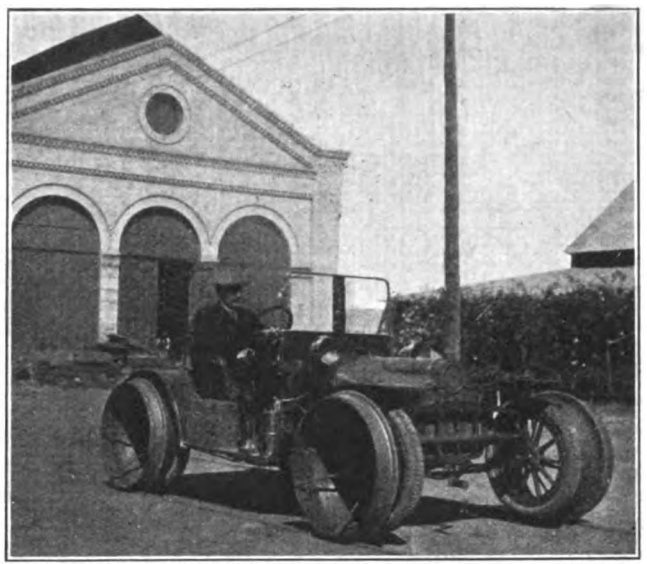
MOTOR CAR ADAPTED FOR RUNNING ON RAILWAYS.





OF recent years much ingenuity has been displayed in arranging for the conversion of motor road vehicles, so that they could easily be utilised on the railway. In the majority of cases the motor car wheels have been taken off and flanged wheels suitable for running on railway tracks substituted.

By the courtesy of Mr. G. L. Boag, General Manager of the Great Southern of Spain Railway, we are enabled to describe and illustrate a simple and ingenious attachment designed by Mr. S. O. Browne, Locomotive Superintendent, to enable him to run his own two-seater motor car on railway tracks. The arrangement consists of four easily detachable wheel shells, which are supplementary to the ordinary wheels of the motor car, and can be fitted or dismantled in less than half an hour.

The treads are turned down out of wornout tyres and welded on to a wrought-iron cone, the inner edge of which bolts on to the spokes and rim, while five radial stays are welded to the outside edge of the flange, and bolted on to the hub bolts of the car.

It will readily be appreciated that this motor vehicle, so adapted, has proved very useful. It is frequently employed by Mr. Browne for visiting outlying engine sheds and depôts when ordinary trains are not available.

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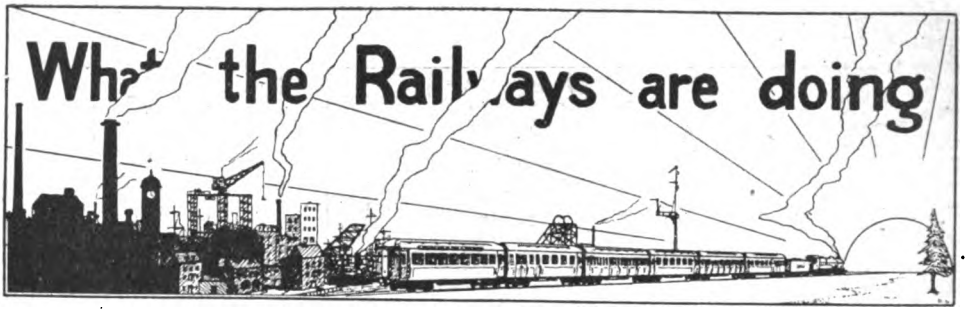

CAPTAIN N. S. NICHOLAS, R.E., who was appointed to the position of Locomotive Engineer to the Inter-Allied Commission, Eisenbahn Direction, Kattowitz Oberschl, Germany, on January 1, 1921, was previously Chief Locomotive Engineer to the Railway Section of the British Military Mission at Bucarest, Roumania. Prior to August, 1914, he was a premium apprentice in the Lancashire and Yorkshire Railways' locomotive works at Horwich, under Mr. G. Hughes, the Chief Mechanical Engineer. He joined up immediately on the declaration of war, and served in the Motor Transport, Machine Gun Corps, Tanks and Railway Operating Division. He is the eldest son of Mr. B. S. Nicholas, retired District Passenger Superintendent, Lancashire and Yorkshire Railway, Manchester.

CAPTAIN N. S. NICHOLAS, R.E.,
Locomotive Engineer to the Inter-Allied Commission, Eisenbahn Direction, Kattowitz Oberschl, Germany.

* * *

THE directors of the London, Brighton and South Coast Railway, in their annual report, record with deep regret the sudden death in December last of the late Chairman, the Earl of Bessborough. "His occupancy of the chair" the report adds, "was distinguished by a broad-minded and tactful policy and an earnest desire on all occasions to safeguard and promote railway rights and interests. Not only the company and his colleagues but the general body of railway proprietors of the country have sustained loss by his death." The report further records that Mr. Macrae, the Deputy-Chairman, has succeeded Lord Bessborough as Chairman, and Lord Henry Nevill has been appointed Deputy-Chairman; and that Mr. Frank Dudley Docker, C.B., has been elected a director in place of the late Sir Philip Rose.

* * *

FROM March 1 Major C. L. Conacher O.B.E., (formerly General Manager of the Isle of Wight Central Railway and Traffic Manager of the Cambrian Railways), will assume control of the midland area of the Ministry of Munitions, in addition to the western area, which he took over on January 1. Major Conacher's headquarters will be in Birmingham, and the territory under his supervision will extend from the eastern and midland counties to the west and south of England, and will embrace South Wales.

* * *

SIR THOMAS WILLIAMS, formerly General Manager of the London and North Western Railway, has been appointed by the Minister of Transport to be a member of the Committee set up to inquire into and advise him on the question of the running by railway companies of road services for goods traffic. The appointment of the Committee was announced on January 26 last. Sir T. Williams takes the place of Mr. C. Aldington, General Manager of the Great Western Railway.

* * *

THE hundredth concert of the Great Eastern Railway Musical Society was held in the Liverpool Street Hotel, London, on February 2. The chair was taken by Lady

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Thornton, and there was the customary large audience. The music was provided by the Society's full orchestra; Miss Dorothy Smithard, contralto, Mr. Joseph Reed, tenor, and Miss Hilda Bertram, solo pianist. One of the principal items of the programme was the Tschaikowsky Piano Concerto in B flat minor (Op. 23), in which Miss Hilda Bertram did admirably, and the orchestra also acquitted themselves well. Colonel Galloway conducted and Mr. Sydney Harrington, F.R.C.O., acted as accompanist at the piano. On the motion of Sir Charles E. Ellis, K.C.B., G.B.E., a vote of thanks was accorded Lady Thornton for presiding. Sir Henry Thornton, K.B.E., in responding on Lady Thornton's behalf, spoke words of encouragement for the future. He mentioned the pride they had in the achievement of the Society, for which he thanked Colonel Galloway and others concerned. Colonel Galloway expressed the pleasure it gave him and the members and others who were associated with him in the Society's advancement that their efforts were so heartily appreciated. A hand-painted ivory fan was presented to Lady Thornton by Mr. S. A. Parnwell, Chairman of the Committee, as a souvenir of the occasion.

* * *

At the Radstock colliery offices a gathering of representatives of coalowners and general traders of the district has taken place for the purpose of making a presentation to Mr. George Henry Eyre, of Bath, late Traffic Superintendent of the Somerset and Dorset Railway, in recognition of the services he had rendered the public during his long connection with the railway. He received a gift of plate, a pair of entree dishes on stands, with spirit lamp, a soup tureen, and a bacon dish on stand, with lamp, each article being engraved with the initials of the recipient. Accompanying it was an illuminated address. Colonel Sir Frank Beauchamp, who presided, paid tribute to Mr. Eyre's efforts on behalf of the users of railways. Other speakers supported, and Mr. Eyre, in response, said that when he became connected with the company in 1876 he at once saw that in the Radstock district lay a great opportunity for trade, which was now about six times what it was when he began.

* * *

The first annual dinner of the staff of the South Eastern and Chatham Railway London Distric Traffic Superintendent's office was recently held at Cannon Street Hotel. Mr. E. J. Missenden, the District Superintendent, presiding. Mr. Missenden was supported by Mr. H. E. O. Wheeler, O.B.E., Assistant Superintendent of the Line; Mr. H. H. Hayter, Outdoor Assistant to the Superintendent of the Line; Mr. R. Richards, Assistant District Superintendent, London District; Mr. E. J. Sears, Assistant District Superintendent, Western District; Mr. J. C. Taylor, of McCorquodale & Co., Limited; and Mr. F. Browning, Personal Assistant to the Superintendent of the Line. A most enjoyable evening was spent, the musical programme being contributed to by Miss C. Jones, Miss W. Wall, Mr. H. E. O. Wheeler, O.B.E., Mr. E. A. Richards, Mr. F. Grayer and Mr. L. Lawrence. The company present numbered 50.

* * *

The Board of Management of the Railway Benevolent Institution, of which Major-General Sir H. W. Thornton, K.B.E., General Manager of the Great Eastern Railway, is Chairman for the year 1921, has decided to resume the custom of holding an annual dinner, which, owing to the war, has been discontinued since 1915, and arrangements have been made for the dinner to be held at the Hamilton Hall, Great Eastern Hotel, Liverpool Street, on Tuesday, May 10 next, when the chair will be taken by the President of the Institution, Mr. E. B. Fielden, Chairman of the Lancashire and Yorkshire Railway.

* * *

At a meeting of the Irish Railway Clearing House Committee the Right Hon. Sir William J. Goulding, Bart., D.L., was unanimously elected Chairman of the Committee for the year 1921.

* * *

It is announced by the London, Brighton and South Coast Railway that at a recent board meeting Mr. C. W. Edwards, the Chief Assistant in the Accountant's office, was appointed Assistant Audit Accountant.

* * *

Under the auspices of the Model Railway Club an exhibition of models is to be held at Easter. The Committee invite exhibits from non-members and prizes will be awarded both members and non-members. Particulars of the classes open to non-members may be obtained by sending a stamped and addressed envelope to the Hon. Secretary, Mr. T. W. Pitt, 17, Northumberland Avenue, Wanstead Park, E.12.

* * *

At a recent Council Meeting at the Institute of Transport, 13 members and 4 associate members were elected, while 16 graduates and 6 students were admitted. There are now 335 members, 307 associate members, 135 graduates and 72 students, making a total of 849, attached to the Institute

* * *

At the annual general meeting held at the Railway Club, Leplay House, Belgrave Road, S.W. 1, on Friday, February 11, an

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encouraging report was presented by the hon. sec. Mr. B. M. Bazley. The past year has been one of great success and decided progress. After the formal business a paper by Mr. H. L. Hopwood, entitled "Ten years' progress at Doncaster Works, Great Northern Railway." was read by Mr. Ford-Stevens, in the unavoidable absence of the author. The paper was followed in keen interest and a number of members subsequently spoke on Great Northern locomotive and rolling-stock topics. At the monthly general meeting on March 11, Mr. Kenneth Brown will present "Railways-in-Law; grains of Railway History gleaned from Law Reports."

* * *

MR. CHARLES C. MACRAE, J.P., the new Chairman of the London, Brighton and South Coast Railway, made an eloquent speech at the unveiling and dedication of a memorial to the men of the company's carriage and wagon works, Lancing, who fell in the Great War. Mr. Macrae's remarks have been described as some of the most sincere utterances which such occasions have called forth. The handsome memorial, illustrated on page 156 is of white polished marble and stone. It is an obelisk rising from the centre of gracefully curving supports with a central panel bearing in bold lettering the inscription:—"To our comrades who fell in the great war, 1914–18," with flanking panels of marble bearing the names of the 76 men of the Lancing Works

Who, loving as none other
The land that was their mother,
Unfalteringly renounced her,
Because they loved her so.

* * *

THE memorial erected at Broad Street Station, North London Railway, in memory of the 64 North London railwaymen who fell in the Great War, was unveiled on February 10, by the Hon. A. Holland-Hibbert, Chairman of the North London Railway. The memorial consists of a monument 12 ft. 9 in. high and 3 ft. square. The base is of grey granite and the upper part of Hopton woodstone of a brown colour. The four sides have sunk panels, in one of which is incised the inscription: "In memory of North London railwaymen who fell in the Great War 1914–1919." The names of the fallen are incised in the remaining three panels, and above the inscription there is a projecting block of stone with a raised wreath of laurel leaves carved on it. All the lettering is executed in Roman characters. The monument terminates with a cornice moulding surmounted by a slightly tapering block of stone.

THERE has been unveiled at the Goole offices of the Lancashire and Yorkshire Railway (Goole Steam Shipping) Company, a handsome memorial erected in honour of 21 officers and men who lost their lives in the war. The memorial, which consists of a massive brass tablet in mahogany frame, occupies a prominent position in the window of the Marine Superintendent's office, as will be seen by the illustration on this page. At the top is a representation of one of the company's steamers, with the periscope and conning tower of a submarine visible ahead. Below are given the names of the steamers

LANCASHIRE & YORKSHIRE RAILWAY (GOOLE STEAM SHIPPING) COMPANY'S WAR MEMORIAL.

mined or torpedoed and the men who lost their lives as the result.

* * *

Two new electrical clocks have been installed at St. Pancras Station, London. One is located over the buffers of No. 1 road, and the other on the opposite side of the station over No. 7 platform. Each has two faces arranged in plan V-shape, the wall being the top of the V. They are illuminated from within. The figures at 3, 6, 9 and 12 are replaced by black diamonds, the intervening figures being indicated by one line in each case,

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so that no numerals appear on the clock face. Under the dark roof the clocks show up splendidly. They are attached to the top of the wall under the roof span, and can be seen from all platforms and from the circulating area.

* * *

RESIDENTS in London and its suburbs, to say nothing of the many thousands of visitors to the metropolis, will greatly appreciate the useful map that is being distributed by the Metropolitan Railway. It is adapted as a folder for pocket use and embodies the electric railways of London and the district served by the Metropolitan and Great Central Joint Railway. In addition to the map itself, which cleverly combines the London electric railway system and the extension line, although on different scales, there are four smaller key plans of theatres and music halls, London railway termini, London historical buildings and historical places on the extension line, each one showing the Metropolitan Railway's local facilities. Sixteen important residential districts on the extension line are also described briefly, and illustrations are given of four of these places. Copies of the map may be obtained from Mr. J. Wardle, Commercial Manager, Metropolitan Railway, Baker Street Station, London, N.W.1.

* * *

CANADA paid a striking tribute to the working organisation of English railways when the High Commissioner of Canada, Sir George Perley, presented Mr. James Wright, Theatrical Agent of the London and North Western Railway, with an illuminated address on the occasion of his retirement after 42 years' service. The illustration on this page shows Sir George Perley (right) handing the address to Mr. James Wright.

* * *

IN reference to a correspondent's remarks on page 131, February RAILWAY MAGAZINE, Mr. E. M. Bywell, writes:—"My records show Ravenscar Station to have been known as Peak Station up to October 1, 1897."

* * *

THE directors of the North Staffordshire Railway are applying to Parliament for powers to raise further capital by the issue of £500,000 debenture stock, ranking next after the existing debenture stock. It is proposed to take power to issue the stock "so as to be redeemable either at par or at such premium (not exceeding 5 per cent.)" as the directors may determine. The stock is to carry interest at the rate of 4 per cent. per annum, or such higher rate, not exceeding 10 per cent. per annum, as the directors think fit.

* * *

MR. F. A. L. BARNWELL, General Manager, North Staffordshire Railway, in a recent speech, said one of the company's schemes is a Bill for a new line. The present line between Etruria and Stoke Junction

Photo.] [*Tella.*

MR. JAMES WRIGHT RECEIVING AN ILLUMINATED ADDRESS FROM SIR GEORGE PERLEY.

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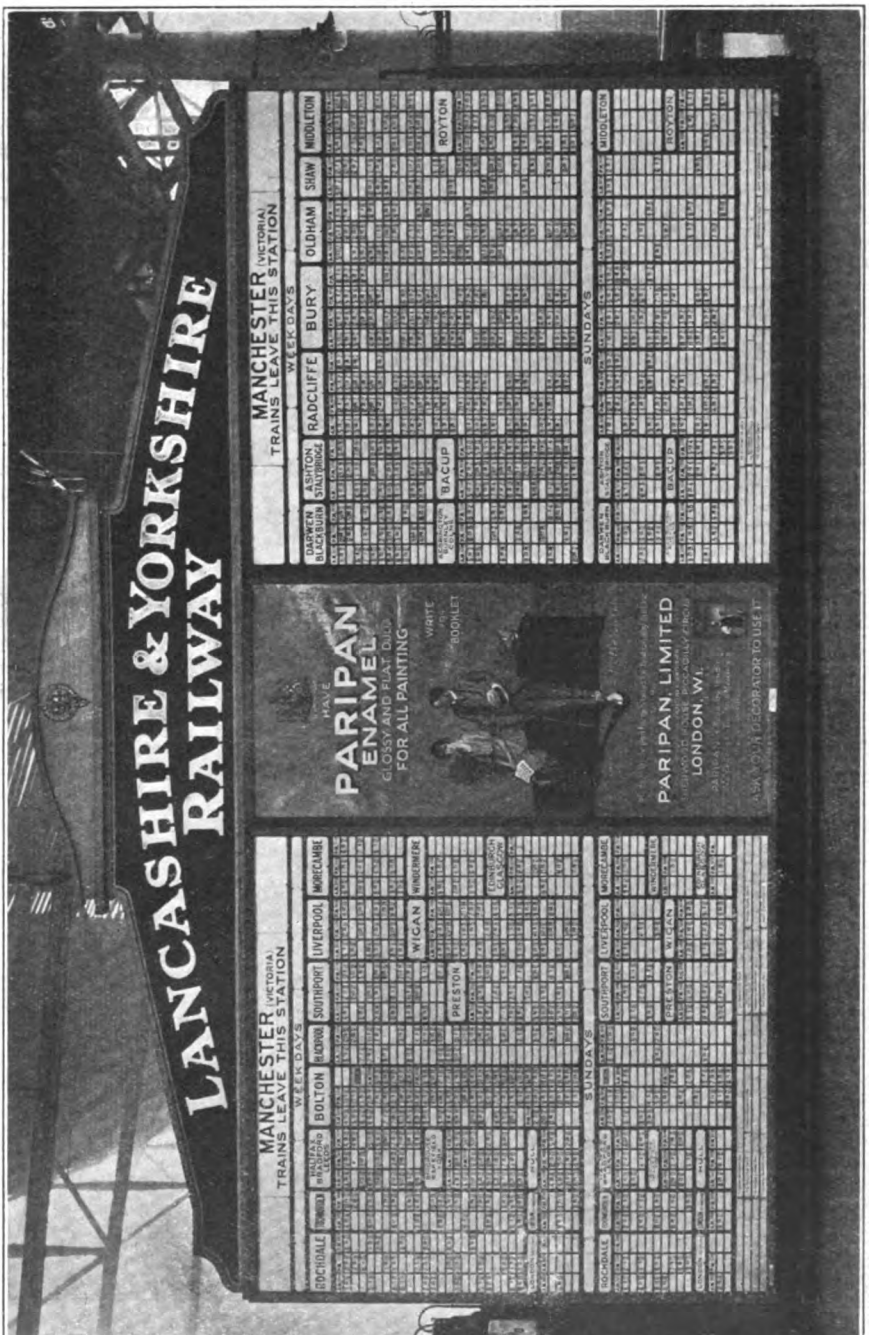

NEW TRAIN INDICATOR AT VICTORIA STATION, MANCHESTER, LANCASHIRE & YORKSHIRE RAILWAY.

The indicator is fixed in a prominent position facing the booking office.

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is a bottle-neck communication two miles long, through which all the converging traffic from Crewe, Macclesfield, Manchester, and the loop line on the north, from Stafford and the North Western main line on the south, from Derby and Burton on the Midland, and from the Biddulph Valley has to pass, right in the heart of the North Stafford system. The new line between Etruria and Stoke is not only necessary to meet the existing traffic, but it is obvious that no improvements can be made in the passenger and goods facilities in the Stoke area until they have the new line from Etruria to Stoke.

* * *

MUCH interest was taken in the illustration of Kew Station, and the accompanying letterpress on page 140, February RAILWAY MAGAZINE, but it is pointed out that in one respect our correspondent erred. For "1860" he should have said "1858" as that was the year in which North London trains began to run to Twickenham.

* * *

ON and from March 21 the London, Brighton and South Coast Railway night service between London and Rouen and Paris *via* Newhaven and Dieppe will be resumed. The service will be first, second and third-class, the train leaving Victoria at 8.20 p.m., arriving at Dieppe 2 a.m., and Paris (St. Lazare), 6 a.m. The train in connection with Dieppe arrives at Rouen 7.26 a.m. The return train will leave Paris (St. Lazare) on Tuesday, March 22, 9 p.m.; Rouen, 11.15 p.m., and Dieppe, 1.15 a.m., arriving Victoria, 7.55 a.m.

* * *

BOTH day and long-period excursion bookings are being arranged for the Easter holidays. Special excursion trains will be run both to seaside resorts and between industrial centres. The fare for the day trips to holiday resorts will be the single fare for the double journey, as in the case of last year's "Holiday Day Excursions," and the fare for the journeys between industrial centres and for all long-period bookings, details of which are not yet available, will be the single fare and a third for the double journey. The provision of a series of summer excursions is being considered, and although no decision has yet been reached it is anticipated that excursion facilities will show considerable development during the next few months. Gradually pre-war facilities of travel will be regained, and it is understood that, even if certain fares are not more reduced, the single fare for the double journey will be the basis adopted for the holiday excursions.

REFERRING to the paragraph on page 139 of the February RAILWAY MAGAZINE, Mr. R. T. Whitmore mentions other old Pullman cars now used for depôt purposes on the Midland Railway. Besides that at Bath mentioned by Mr. Hewitt, he specifies one at the C.L.C. carriage sheds at Cornbrook, Manchester. Mr. Whitmore refers to another near Cheadle Heath, though as to this he is not quite certain. We may also mention one at Little Ilford carriage sidings on the London, Tilbury and Southend section.

* * *

FOR some time the question of using oil fuel for locomotive purposes has been under the consideration of the Locomotive Department of the Highland Railway. Under the direction of Mr. C. Cumming, Locomotive Superintendent, one of the "Clan" superheated engines has been fitted at the works at Inverness with the Scarab oil burning apparatus. On its trial runs the oil engine drew a load of 420 tons from Inverness to Forres and back. In the train were Mr. Robert Park, General Manager; Mr. Thomas MacEwen, Traffic Manager; Mr. Geo. T. Cornet, Secretary; Mr. W. C. Watson, manager, Hawthorn, Leslie and Co., Forth Banks Works, Newcastle-on-Tyne, the builders of the locomotive. Mr. J. E. Armstrong, Chief Engineer of the Scarab Oil Burning Company, London, and Mr. C. Cumming, Locomotive Engineer, occupied the footplate. The engine was worked by Driver Wm. Tulloch and Fireman John Rollo. The result of the trial run was so satisfactory that it was arranged that the engine should work the 10.30 a.m. express train from Inverness to Perth. This latter run over the main route was a severe test. The many difficult gradients were negotiated in a satisfactory manner. Perth was reached a little after scheduled time. The oil engine made its return journey, working the 11.55 a.m. passenger train from Perth. The train arrived back at Inverness at scheduled time. Although there were one or two little flaws, which had to be dealt with, the test was eminently satisfactory. Mr. Cumming, under whose charge the tests were carried out, Mr. Armstrong and Inspector Goulder, were on the engine on the Perth run. The engine, converted from a coal burner to an oil user, has five oil containers with a total holding capacity of about 700 gallons of oil. The heat is evenly distributed round the boiler by a special apparatus.

* * *

GREAT Northern Railway new 0-6-2 type tank engines are fitted with the Wakefield mechanical lubricator and anti-carbonising device, and a special feature is that the lubricator is affixed to the front end of the

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tank on the left-hand side of the locomotive, and is driven through suitable mechanism from the motion underneath the boiler. The arrangement is a neat and effective one, and on referring to the photographic illustration facing page 143, the exact location of the mechanical lubricator can be seen.

* * *

IN passenger traffic on the Lancashire and Yorkshire Railway there was a considerable expansion in 1920 as compared with 1919, even allowing for the fact that the numbers of passengers originating on the system—92,407,792 in 1920 as against 79,119,010 in 1919—do not include traffic conveyed free on behalf of the Government up to March 31, 1920. The same proviso applies to the tons of goods traffic so originating, which increased from 13,950,988 in 1919 to 14,744,422 in 1920. In season tickets there was an increase from 63,895 to 72,818. Coaching train-miles (loaded trains) increased from 7,872,451 to 9,519,213 in the case of steam trains, and from 1,889,391 to 2,060,117 with electric traction, whilst goods train-miles (loaded trains) increased from 4,018,464 to 4,659,624.

* * *

DURING the past year large additions have been made to the Metropolitan Railway's rolling-stock, and have had a marked effect in relieving the congestion of traffic experienced during the rush hours of the day. Four steam locomotives of a powerful type and seven new trains of six coaches each have been placed in service. Of the new cars ordered for the electric service, 12 have been delivered and others will be available shortly. The re-equipment of the existing electric locomotives with high-powered motors is being gradually effected. Arrangements for augmenting and improving the generating plant at Neasden are proceeding favourably, and when completed, these and other works in hand will amply provide for a substantial development of the company's business. The proposal for building an hotel at Baker Street Station has been abandoned by agreement with the Strand Hotel Company, and the contract entered into early in 1915 for its erection has been cancelled. Arrangements are in progress for leasing the site for other purposes on advantageous terms.

* * *

ACCORDING to the annual report of the Queensland Commissioner for Railways the present mileage of State railways is 5,685. During the financial year ended on June 30 last, 73 miles of railway were opened by the State, and since then 50 miles have been added. In addition to the railways vested in the Commissioner there are 131 miles of Queensland standard gauge line (3 ft. 6 in.) built by various local authorities and companies.

GREAT NORTHERN RAILWAY (IRELAND).

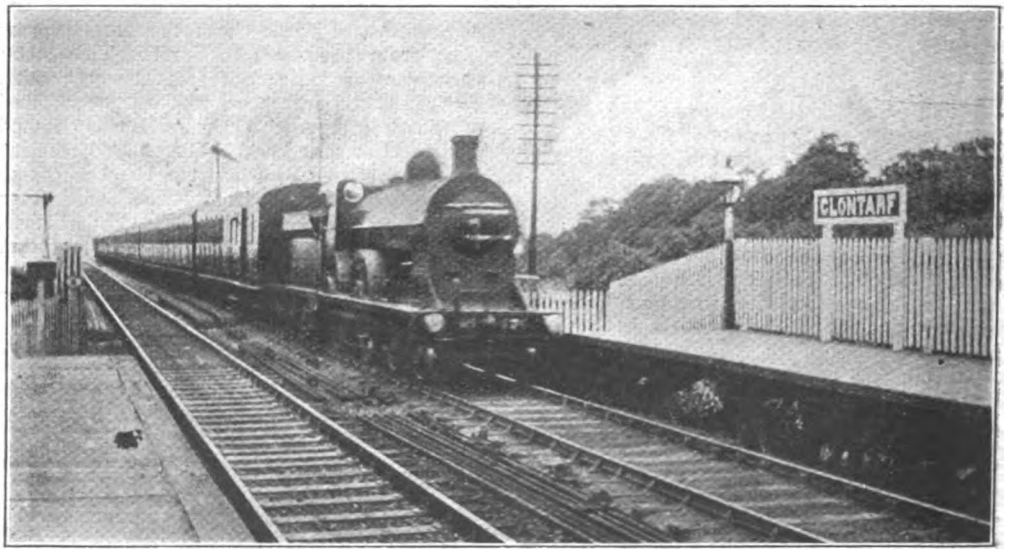

Photo.] [*J. J. Kennedy.*

DUBLIN-BELFAST EXPRESS PASSING CLONTARF.
4-4-0 Locomotive No. 171. "Slieve Gullion."

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THE RAILWAY MAGAZINE.

Contents for April, 1921.

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COMING EVENTS.

April 8th—Mr. D. H. F. MEADCOCK—Railway Publicity; Leplay House, 7.30 p.m.
" **8th**—Nine Elms Sheds, L. & S.W.R., 2.30 p.m.
" **23rd**—Hayes Creosoting Works, G.W.R., 2.23 p.m. train ex Paddington.
May 13th—Mr. CECIL J. ALLEN—Some Considerations affecting Passenger Train Time-keeping; Leplay House, 7.30 p.m.

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212-5

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[*Photo: F. E. Mackay.*

GREAT NORTHERN RAILWAY.

5.30 P.M. LONDON–NEWCASTLE DINING CAR EXPRESS.

4-4-2 Locomotive, No. 1447.

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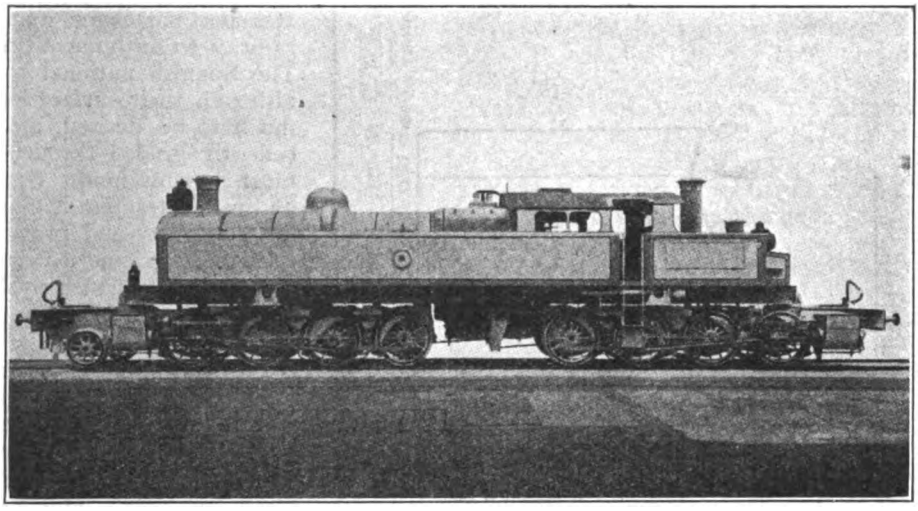

KITSON-MEYER LOCOMOTIVE USED FOR BANKING ORE TRAINS.

The Great Southern of Spain Railway.

MOST of the railways in Spain have been built with French capital, but there are several short lines owned and worked by British companies. Of these, perhaps the most important is the Great Southern of Spain.

This company was originally formed in 1885 to construct a railway from Murcia to Granada, thus linking up the trunk lines on the Atlantic and Mediterranean sides of the peninsula. A branch line was also constructed down to the port of Aguilas on the Mediterranean coast. An unfortunate series of difficulties intervened to prevent the company carrying out its original programme, and the line, as definitely constructed, terminates at Lorca on the Murcia side and at Baza on the Granada side. Hence the Spanish name of the company, "Lorca-Baza y Aguilas" (not to be confounded with the neighbouring "Sur de España" line, which runs from Linares and Granada down to Almeria).

The length of the railway is at present, and including the Aguilas branch, 104 miles, all of single track. The gauge is 5 ft. 6 in. and the permanent way is of 30 kilog. f.b. rails laid on creosoted Spanish pine sleepers. Maximum grade is 2 per cent. and the minimum curvature allowed is 300 m. radius. Ballast, except on certain sections where broken stone has been laid, is of gravel and earth. The track is well maintained on about ·8 men per kilometre, although this may have to be increased since the eight-hour day has been legally imposed. The longitudinal section shows a long climb up from the coast to Hijate, at 3,185 ft., where the line crosses from the Mediterranean watershed to that of the Atlantic, not far from the sources of the river Guadalquiver. The route up the Almanzora Valley is not wanting in picturesque features reminiscent of the long struggle between the forces of the Catholic Kings and the retreating Moors. The towns of Baza, Seron and Lorca were all subjected at different times to raids and long sieges by one or other of the opposing forces. Throughout the length of the valley the old Moorish watch towers, built at commanding points, are a reminder of the days when beacon fires heralded the approach of an invading force. The countryside is largely barren and its very appearance suggests brigands. Indeed, a decade has hardly passed since the last stage coach was stopped by highwaymen on the old Guadix Road. Now the stage coach has been universally supplanted

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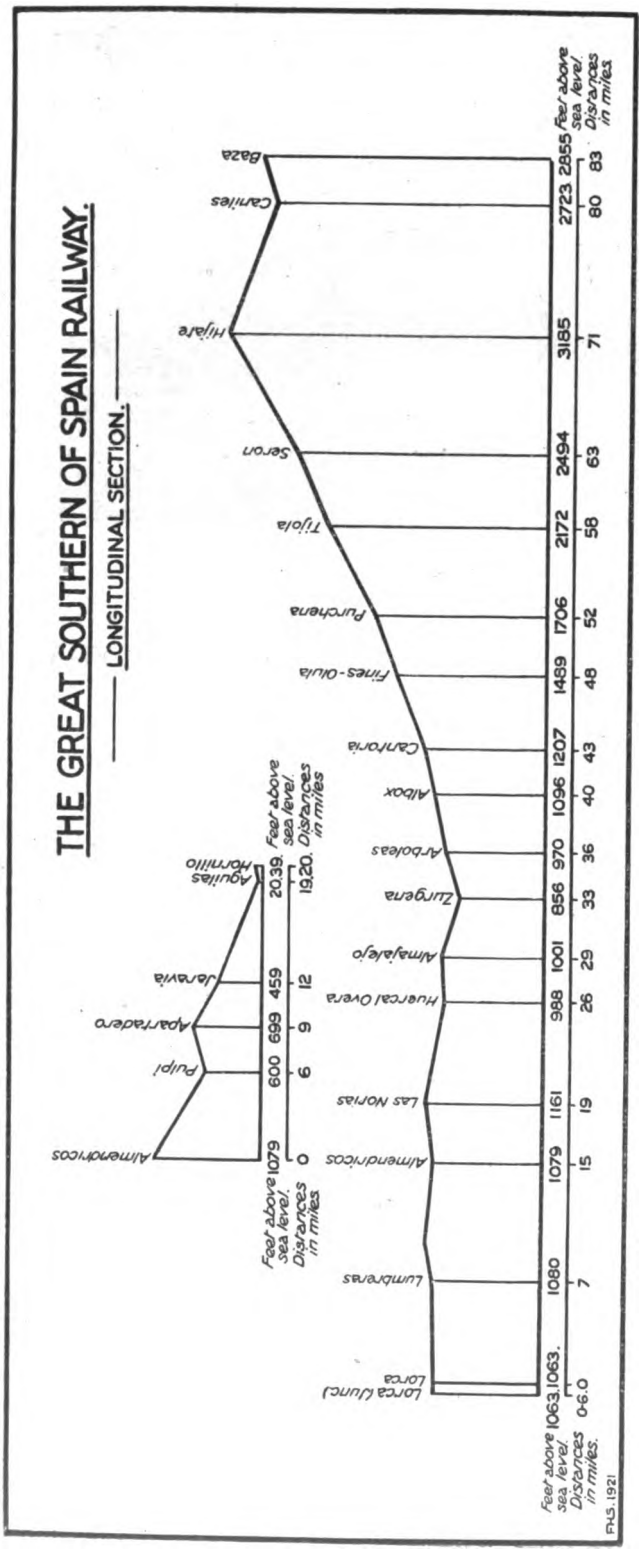

by motor omnibuses, which transport passengers from the railway to outlying districts. The Spanish national roads, although their surface leaves much to be desired, are excellently graded through the most mountainous regions, and motor traction is extending every day and promising to become in time a valuable feeder, rather than a rival, to the railway.

The principal traffic of the Great Southern of Spain is iron ore, brought down to the railway over aerial ropeways from the various groups of mines in districts served by the railway. The principal of these groups is that of Bacares, in the province of Almeria, from whence the ore is brought down to Seron station by several aerial ropeways, varying between 6 and 10 miles in length. Seron is 70 miles from the coast by rail, and the ore is taken from there to Hornillo Bay, adjoining the port of Aguilas, for shipment over the company's pier.

In normal years, before the war, as much as 650,000 tons were thus carried and shipped annually, mainly to United Kingdom ports. The ore is tipped from the cable buckets into bunkers at the forwarding station, and from the bunkers it is loaded through gravity chutes into the wagons. The special rolling-stock used for this traffic consists of 175 steel bogie hopper trucks of 35 tons capacity, the tare being 14½ tons. The percentage of revenue load to gross weight is, therefore, slightly over 70. Trains are made up of 12 loaded wagons, load being limited by the number of empty wagons that can be hauled up the long 2 per cent. grades. These trains, hauled

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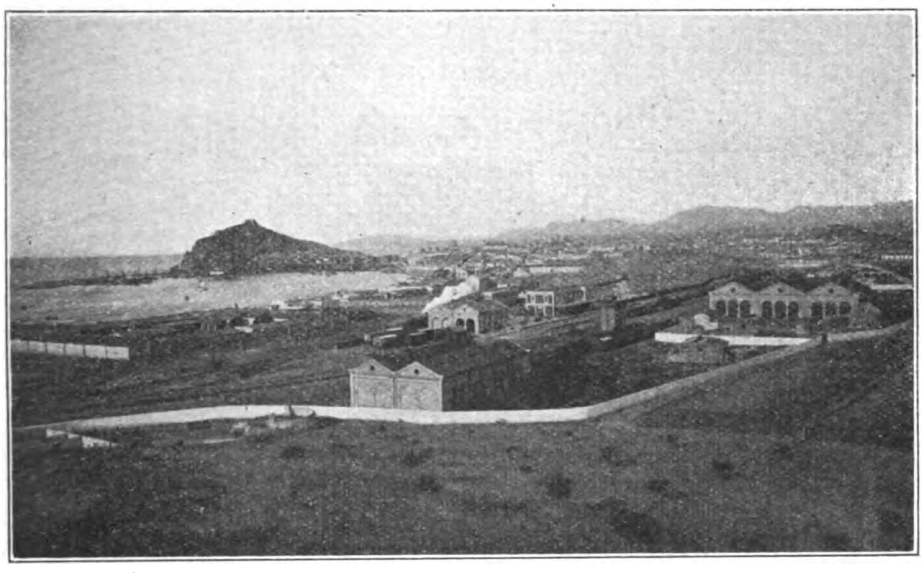
by 2-6-0 locomotives of British design and construction, are run with the vacuum automatic continuous brake coupled up on both up empty and down loaded journeys. No brake van is carried, but a certain proportion of the wagons are fitted with brakesmen's shelters, and one brakesman accompanies each train. Working costs as regards train crews and dead weight are thus reduced to a minimum.

The ruling gradients are in favour of the load, except that, unfortunately, there are two counter grades of 2 per cent., one being of considerable length. On the shorter one (4 kilometres) trains are divided and hauled up in two sections. On the longer one (Zurgena-Huercal) a banking engine has to be provided, as otherwise the train engines could not perform the round trip in the day. The banking service is performed by large simple-expansion Kitson-Meyer type locomotives, with four opposed cylinders and 2-8-8-0 wheel arrangement. The trains run double-headed from Zurgena to Huercal, and from the latter station to kilometre 37, where the counter grade ends, the banking engine works, uncoupled, at the tail of the train, returning at the end of the grade without stopping the train.

An interesting traffic problem is thus solved, as the banking engine has to be back at the foot of the counter grade (Zurgena) in readiness to assist the next train. All these ore trains are scheduled on a time-table, and, as the whole system is single line, and ordinary goods and passenger service has to be run, the counter grade section, with double journeys of banking engines, is generally working at its full capacity The round trip from Aguilas to Seron and back is scheduled at about 12 hours

At Hornillo Bay the company owns storage deposits, built over the main lines leading to the pier, with capacity for about 50,000 tons, and here the ore is stored when steamers are not loading. With steamers in berth trains are run directly on to the pier, while, to increase despatch, ore is also loaded from the storage deposits through gravity chutes into wagons, which are then shunted on to the pier. There are berths for two steamers, and upwards of 3,000 tons can, in favourable conditions, be put on board in a working day of eight hours. The wagons are run on to the pier and the bottom doors opened over hoppers leading on to chutes, which carry the ore into the steamer hold, the empty wagon being traversed by hand on to a return track.



GREAT SOUTHERN OF SPAIN RAILWAY HEADQUARTERS AT AGUILAS.

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An auxiliary belt conveyor is being provided for loading large steamers whose hatches are above the level of the ordinary chutes.

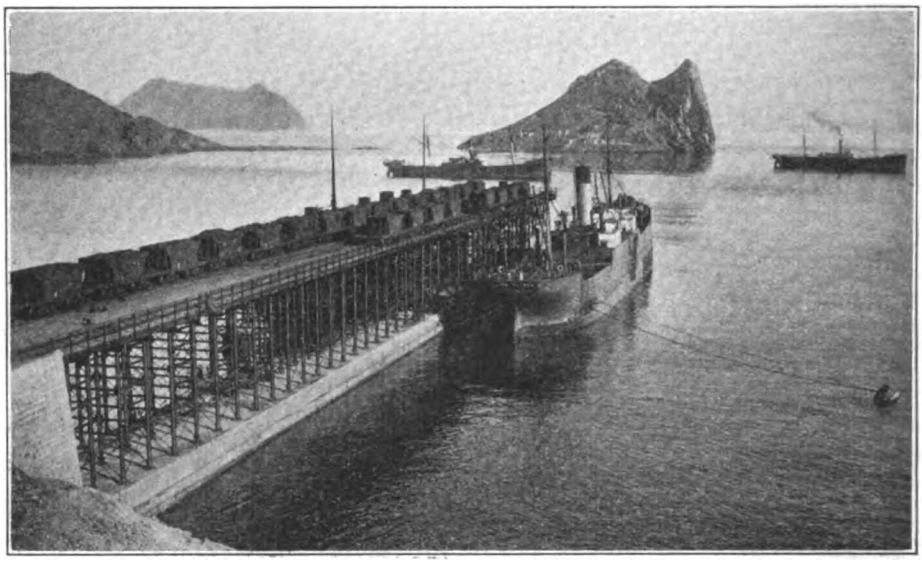
From the foregoing it will be seen that the ore traffic is handled with the greatest economy, gravity chutes being employed throughout, reducing labour costs to a minimum.

The company is obliged, under its concession, to run one passenger train each way daily, and a fair tonnage of merchandise traffic is also carried, consisting chiefly of agricultural products, marble and esparto grass; 182,000 passengers and 115,000 tons of merchandise (exclusive of iron ore) were carried in 1919. The total train miles run in 1919 were 313,843, the receipts per train mile being 142·91d. and the expenses 121·90d. The ratio of expenditure to receipts was, therefore, 85·30.

The whole of the traffic is run over a single line, on the telegraphic line-clear system. Mineral trains stop only at water stations, the drivers picking up their line-clear tickets by means of a wire hoop fitted with a pocket to hold the ticket. Crossing stations are provided at about every 10 kilometres (6 miles).

One of the most serious problems the company has had to deal with has been that of water supply, the springs along the route being generally heavily charged with mineral salts derived from the local limestone or gypsum formation. A fairly soft water is pumped out of the river bed at Tijola and carried down through 42 kilometres of 3 in. pipe to the different water stations along the line, while at the coast terminus a condensing plant, of 120 tons daily capacity, provides water for the lower sections of the line.

The Great Southern of Spain, like most other undertakings of the kind, has suffered severely from the effects of the war. The company, after a long struggle, had brought about a favourable rate of working expenses, and was in a fair way to achieve prosperity, but dwindling ore shipments and the enormously increased cost of fuel and materials during and since the war period have caused a serious (but, it is hoped, temporary) set-back in the affairs of the railway. Traffic in passengers and ordinary merchandise is increasing appreciably, and a Bill is now before the Spanish Parliament for powers to increase tariffs by 50 per cent., but the principal revenue of the railway is from the transport and shipment of iron ore, and the future of the Company will be largely affected by the sustained



IRON ORE LOADING PIER AT HORNILLO PIER, AGUILAS.

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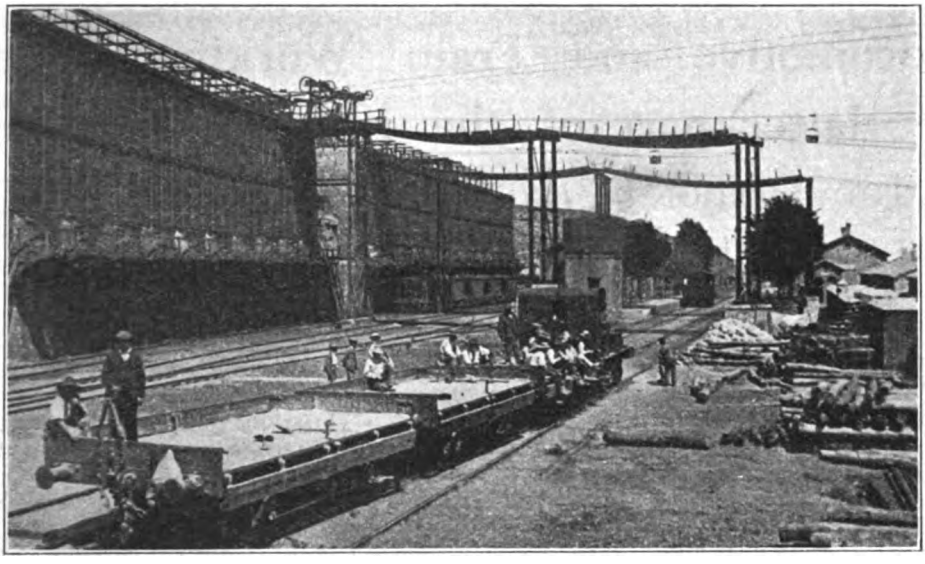

AERIAL CABLES AND BUNKERS FOR IRON ORE AT SERON.

impetus which it is confidently expected will be given to the shipment of that commodity when the present financial difficulties of the world shall have given place to a resumption of ordered and stable progress, such as can alone bring restoration from the dire effects of the war.

ISLE OF WIGHT CENTRAL RAILWAY.

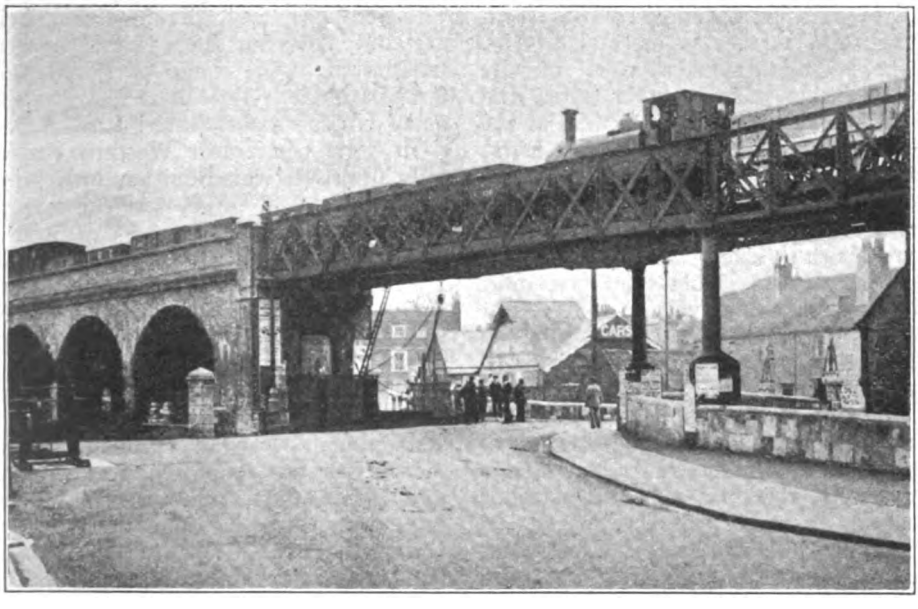

Photo.] [*Edwin J. Miller.*

VIADUCT AT NEWPORT, ON SANDOWN LINE.

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Locomotive and Train Working in the latter part of the 19th Century.

THE LONDON & SOUTH WESTERN RAILWAY.

[No. VII and conclusion.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THERE are few brooms that sweep so clean as the new locomotive broom, and when Mr. D. Drummond arrived at Nine Elms from the "Land o' Cakes" he just looked at Mr. Adams's engines and then promptly proceeded to design something entirely different. Generally speaking, for his earlier engines, he introduced the same type of express 4-4-0 engine with inside cylinders, which had been so successful on the North British and Caledonian Railways, with, however, some enlargement as to size. For 2-cylinder express engines, outside cylinders, which had for so long been a feature of South Western practice, were dropped.

The earliest of the new engines, Nos. 290 to 299 (1898), 280 to 285 and 113 to 122 (1899) were all built at Nine Elms, and have 6 ft. 7 in. coupled wheels with cylinders 18½ in. by 26 in. and 175 lb. pressure. The fireboxes were of the ordinary design without water tubes, and the tenders were 6-wheeled. Most of the 290 class were stationed at Nine Elms, except several of the 113 to 122 series, of which 113 to 115 were at Salisbury and some at Bournemouth. Those at Salisbury ran both to Exeter and to London.

In 1899 Messrs. Dübs and Co. built 30 similar engines but with the important addition of inclined cross water tubes in the fire-boxes, which increased the heating surface by 165 sq. ft. These engines, Nos. 702 to 719, and 721 to 732, had 280 1½-in. tubes giving a heating surface of 1,187 sq. ft. The firebox itself, which is of very large size, has a heating surface of 148 sq. ft., and with the 165 sq. ft. of the water tubes the total is 1,500 sq. ft. A feature of these engines is the long coupling rod, 10 ft. from centre to centre, in order to allow of a long firebox with grate area of 24 sq. ft. The weight of these engines in working order is 50 tons 8 cwt. The water tubes became a feature of South Western practice for 4-coupled express and mixed-traffic engines until Mr. Drummond's death. They certainly increased the steaming capacity of the boilers, but they were not without certain disadvantages on the other hand. Although as far as my knowledge goes, none of them ever burst, yet they sometimes developed what might be termed "pin-holes," which caused leakage from the body of the tube:

The last engines of this class to be built from the end of 1899, the "300" series, have large double bogie tenders of a very unprepossessing appearance. It is said that the South Western cannot lay claim to any level stretches of main line suitable for water-troughs, and therefore the engines are now condemned to pull these heavy tenders about the country, after the manner of a modern Tantalus exerting painful energy in the rock-rolling business.

In 1899 the South Western considerably improved the Bournemouth service. In 1898 the best trains were the 2.15 p.m. down, which took 2 h. 23 m. and the 2.5 p.m. up, which ran to London in 2 h. 20 m., each with one stop. In 1899 the 107½-mile run through from Waterloo was timed to be done without a stop in 2 h. 5 m. with the 10.30 a.m. and the 4.10 p.m. down trains, at an average speed of 51¾ m.p.h. The engine of the 4.10 p.m. down ran through to Weymouth via the loop line between Poole and Hamworthy, and returned the next day, the through time to Weymouth being 3 h. 4 m. The up train for a time had the remarkable booking from Dorchester to Wareham of 15 miles 5 chains in 15 minutes, or a speed of 60·2 m.p.h.,

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but the actual time intended was 17 minutes. Nevertheless, the engines and drivers did their best to keep to the supposed 15 minute schedule, and occasionally succeeded in doing it, though it involved running at 80 m.p.h. down the Wool bank of 1 in 100.

The "702" class did excellent work on these fast expresses, and on one occasion 711 ran from Bournemouth to Waterloo in 15 seconds under the 2 hours, including time lost for a dead stop of 1 minute at Vauxhall signals. The net time was 1 h. 55¾ m. The 46¾ miles from passing Basingstoke to the Vauxhall stop were covered in 45 m. 50 sec. and the last 59 miles required only 59 m. 8 sec. The load was 140 tons, and generally it may be said that six 8-wheeled coaches formed the trains.

Unfortunately signal slacks and stops played too prominent a part in many of these runs, with the result that the actual time taken varied from 130 to 145 minutes instead of the 125 minutes allowed. But the engines did their share of the work well, and usually their net time worked out at 120 to 125 minutes. The following run in 1899 of the 9.0 a.m. from Bournemouth, with engine 703, was particularly good :—

Miles.			
	Bournemouth (C.)	dep.	9.0.45
3¾	Christchurch	pass	9.6.30
9¼	Milton	,,	9.12.35
12¼	Sway	,,	9.15.35
15	Brockenhurst	,,	9.18.15
22¼	Lyndhurst Road	,,	9.25.8
25¼	Redbridge	,,	9.27.35
28¼	Southampton West	,,	9.31.5
	[Slowly round curve]		
29½	Northam	pass	9.32.38
	[Relaying slack]		
35¼	Eastleigh	pass	9.39.40
38	Shawford	,,	9.44.10
	[Relaying 40¾ miles]		
42¾	Winchester	pass	9.51.40
49¼	Micheldever	,,	9.59.5
56¼	Battledown	,,	10.6.48
59¾	Basingstoke	,,	10.9.20
65¼	Hook	pass	10.14.15
67¾	Winchfield	,,	10.16.35
71	Fleet	,,	10.19.45
74¼	Farnborough	,,	10.23.15
	[Slow relaying track]		
78	Pirbright	pass	10.28.40
79½	Brookwood	,,	10.30.15
83¼	Woking	,,	10.33.28
85¾	Byfleet	,,	10.35.43
88½	Weybridge	,,	10.37.50
90½	Walton	,,	10.39.45
93	Esher	,,	10.42.3
95½	Surbiton	,,	10.44.18
100½	Wimbledon	,,	10.49.40
	[Check at Raynes Park]		
103¾	Clapham Junction	pass	10.54.15
	[2 checks Queen's Road and loco. jn.]		
106¼	Vauxhall	pass	10.58.50
107½	Waterloo	,,	11.1.30

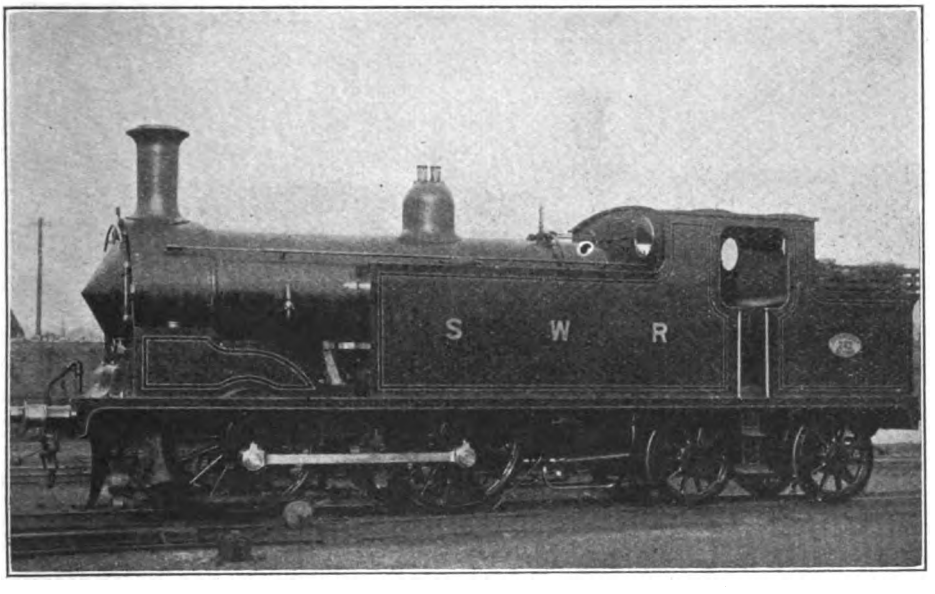

Photo.] STANDARD TANK ENGINE, No. 243. [*A. G. Bolton.*

Designed by Mr. D. Drummond and built at Nine Elms. Coupled wheels, 5 ft. 7 in. diam. Cylinders, 18½ in. by 26 in.

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The time allowed was 125 min. and the 107½ miles were covered in 120¾ min. gross, and deducting 5¾ min. lost for the various slacks, in 115 min. net.

The express engines of the "290" and "702" classes were not, however, the first engines which Mr. Drummond put to work on the South Western, for in 1897 there appeared 30 6-coupled goods engines with 5 ft. 1 in. wheels and 18½ in, by 26 in. cylinders built by Messrs. Dübs and Co. These were the last 0-6-0 goods engines constructed for this railway. for afterwards Mr. Drummond came into line with the later views of Mr. Adams and constructed four-coupled mixed-traffic engines for express goods work.

Whilst the goods engines were being built in Scotland, Mr. Drummond turned out the first of a long series of passenger tank engines of the 0-4-4 type with trailing bogies. Of these Nos. 242 to 256 and 667 to 676 came out from Nine Elms in 1897, and the class of which there are now more than 100 in service has, with minor variations, remained standard, the last of them having been built at Eastleigh in 1911. These engines are much larger than any built by Mr. Drummond for the North British and the Caledonian Railways, and have 5 ft. 7 in. coupled wheels with 18½ in. by 26 in. cylinders. In addition to work on the heavy London suburban services as far as Guildford and Windsor, during the first year or two of their existence, some of them were used for the fast trains on the Portsmouth direct line, and also on the expresses between Exeter and Plymouth. As regards the Portsmouth trains, the work was perhaps not very exacting even for tank engines, for the inclusive "journey speed" of the best "express" (save the mark !) to Portsmouth was well under 40 m.p.h. To the South Western official mind Portsmouth seems to have been an obscure and unimportant village somewhere on the south coast, and for the life of them they could not see why anybody should want to get there quickly. And so they decided that nobody should. At one time Southampton was in like case, but being on the main line to Bournemouth it did afterwards manage to pick up a few crumbs that fell from the table of the latter town, in virtue of the stopping of one or two of the through expresses. But on the Exeter-Plymouth section some of the best trains, which were in competition with the Great Western, ran at very high speeds, especially down the 1 in 70 and 1 in 80 banks.

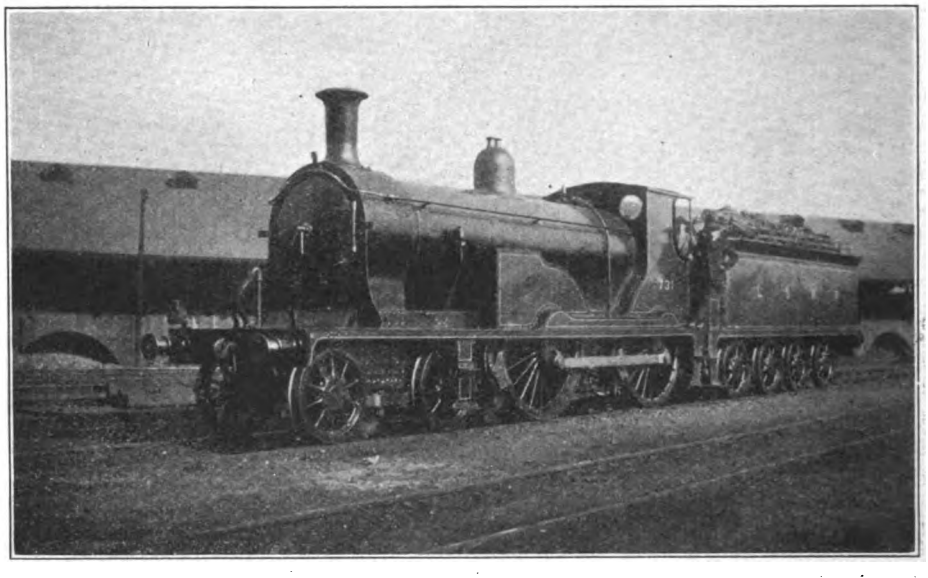

Photo.] [*F. H. Stingemore.*

4-4-0 ENGINE, No. 731 (FIREBOX WATER TUBES REMOVED) AND NEW DOUBLE BOGIE TENDER.

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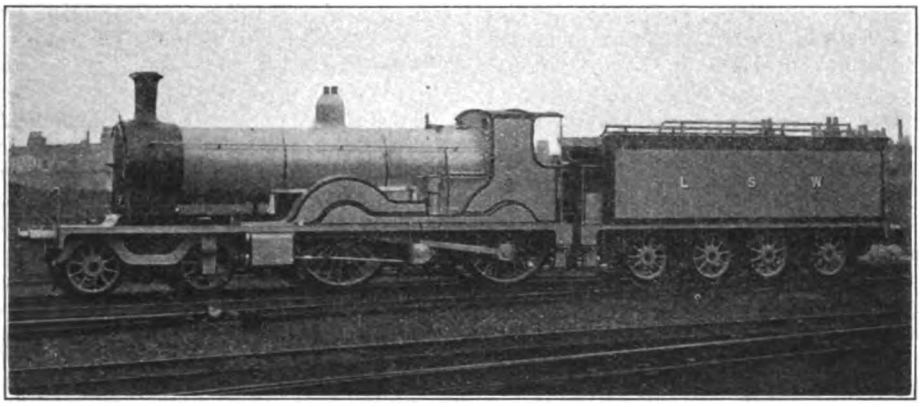
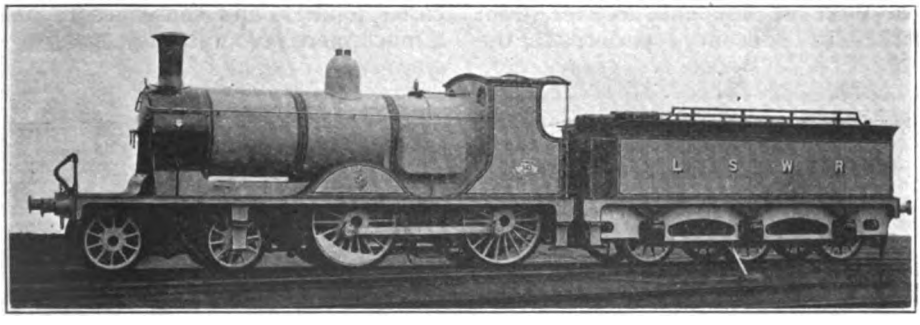


4-2-2-0 FOUR-CYLINDER ENGINE, No. 720.

Designed by Mr. D. Drummond and built at Nine Elms, 1897.

Now it happened that one of Mr. Drummond's tank engines ran off the road when running a fast train at Tavistock, and this occurrence attracted the eagle eye of a Board of Trade inspector, who promptly proceeded to make the most of the employment of tank engines for express trains, and unburdened his soul of an essay on the subject of their unsuitability for this sort of thing. It is an open question and a matter for argument as to whether such far-reaching conclusions could have been properly drawn from this accident. In the first place the speed of the train does not appear from the report to have been above about 40 m.p.h. when it left the rails and it would hardly be considered a practical proposition to limit the speed of all tank engines to less than this amount. On the other hand the rails had originally been only 82 lb. to the yard, and the weight on the driving wheels was 18 tons so that the inspector's second conclusion that the lightness of the permanent way in relation to the heavy weight on the driving axles was also a cause of the bursting of the road was probably justified. But the net result was that the 0-4-4 tank engines were taken off the express trains. At the same time I may remark that 0-4-4 tank engines on the South Western, Midland, and other lines run with perfect steadiness at very high speeds.

The first express engine, however, which Mr. Drummond built for the South Western came out from Nine Elms Works in 1897 before the "290" class was built. This engine, No. 720, was a striking departure from ordinary British locomotive practice of those days and had four high-pressure cylinders 16½ in. by 26 in.



4-4-0 MIXED TRAFFIC LOCOMOTIVE, No. 343.

Designed by Mr. D. Drummond and built at Nine Elms, 1900. Coupled wheels, 5ft. 7 in. diam. Cylinders, 18½ in. by 26 in.

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The inside cylinders drive the leading driving wheels, and the outside cylinders the trailing wheels, and the engine may be described as a double "single driver," since the wheels which have a diameter of 6 ft. 7 in. are uncoupled. The 16½ in. cylinders, however, proved somewhat too large in spite of the large boiler and were subsequently reduced to 15 in. diam., and again to 14 in. diam. The absence of coupling rods enabled the designer to space the independent driving wheels 11 ft. apart and so allowed for a very long firebox. The total heating surface of the boiler was 1,664 sq. ft., of which the flue tubes accounted for 1,307 sq. ft., the firebox 142 sq. ft., and the firebox cross water tubes 215 sq. ft. A large boiler in such an engine is very necessary since four 15 in. cylinders are equivalent to two 21 $\frac{3}{16}$ in. diam. The grate area was 27·4 sq. ft. and the pressure 175 lb. per sq. in. The engine weighed 54 tons 11 cwt. in working order, distributed as follows: On bogie, 16 tons 17 cwt.; on first driving wheels, 18 tons 18 cwt.; and on trailing driving wheels, 18 tons 16 cwt. One of the faults of an uncoupled double-driver engine of this type is that it may at times sway considerably more than an engine of ordinary type, since the swaying action of the independent reciprocating masses may synchronise. This was one of the reasons that the de Glehn compound express engines in France had coupled wheels as a result of the experience gained with the first engine, which had two pairs of uncoupled drivers. Nevertheless No. 720 attained speeds of 76 and 77 m.p.h. during the first year of its life.

On one occasion No. 720, when working a West of England express from Waterloo to Salisbury, performed the journey of 83½ miles in 100¾ min. gross, with one signal stop and two slacks for relaying, the net time being 96 min. and the load 183 tons.

That the 4-cylinder engines of the "720" class could do excellent work with the fastest trains is evidenced by the following run of one of this type which was made some years later. I may add that five more of these engines, Nos. 369 to 373, were built by Mr. Drummond, and it was one of these, No. 370, which was responsible for the run in question with the 10.45 a.m. express from Waterloo. The load was about 170 tons, and one bad check was experienced between Waterloo and Vauxhall.

Waterloo ..	..	dep. 10.46½ due 10.45
Clapham Jn.	..	pass 10.54½
Surbiton ..	..	„ 11.2¾
Woking ..	..	„ 11.14
Brookwood	..	„ 11.17¾
Basingstoke	..	„ 11.37¾
Andover ..	..	„ 11.56¼
Salisbury ..	..	arr. 12 15½ due 12.15

Some of the intermediate times were excellent. From passing Clapham Junction to passing Basingstoke, 44 miles, the time was 43¼ min., and from Clapham Junction to Andover 62¼ miles, 61¾ min. The last few miles into Salisbury were run at only moderate speed as so much time was in hand.

The Drummond mixed traffic, 4-4-0 engines of the "340" class, began to appear in 1900. These have 18½ in. by 26 in. cylinders, 5 ft. 7 in. coupled wheels, and water-tube fireboxes. They are extremely useful engines for all sorts of traffic, and during the early years of the present century their number has multiplied exceedingly. They do not suffer from the burden of the 8-wheeled "water cart" tenders, and consequently present a much more favourable appearance.

LOCOMOTIVE AND TRAIN WORKING ON THE NORTH STAFFORDSHIRE RAILWAY

will next be dealt with by

MR. AHRONS

in this series of Articles.

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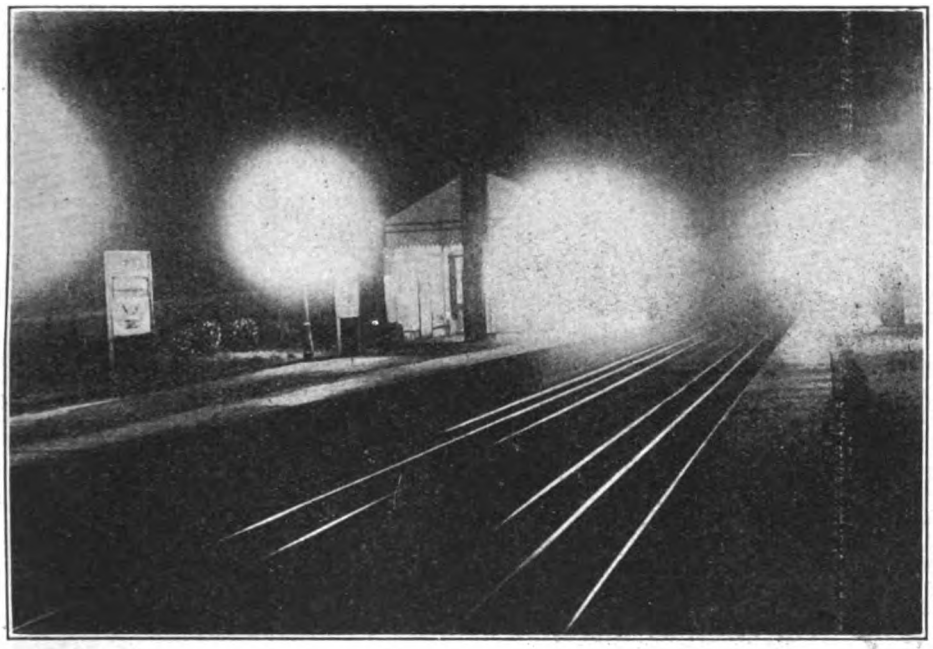

GLARE EFFECT OF LIGHTING AT BOSTON MANOR STATION, METROPOLITAN DISTRICT RAILWAY.

Railway Station Lighting.

AMONG the secondary, but by no means unimportant aspects of railway station construction and equipment is that of night illumination, and this has often been the subject of exhaustive trials and experiments which have many times received attention in these pages. Thus in the May, 1919, number, several pertinent paragraphs were devoted thereto, on the basis of a paper read by Mr. A. Cunnington, lighting engineer, London and South Western Railway, besides many incidental references.

In the case of the London Underground Railways conditions are, in some measure, exceptional, and our London readers will recall the number of changes which have been made in the lighting systems of many tube stations since they were first opened.

On the Metropolitan District conditions may be regarded as a compromise between tube and main line stations, in that open-air as well as covered locations are involved, although even at the most countrified of such stations there is need for lighting on a more generous basis than is required at an ordinary roadside station, while electric illumination is generally available, which is not always the case on steam railways.

Addressing the members of the Permanent Way Institution some time ago Mr. A. R. Cooper, M.Inst.C.E., Chief Engineer (Railways) to the "Underground" group of lines, dealt with this subject in an interesting manner, and some of his remarks in this connection may be quoted :—

Lighting on a tube railway assumes an importance not connected with ordinary railway work, owing to the need for artificial illumination during the whole of traffic hours. Good lighting effects do much to avoid the sense of a confined space and to remove the prejudice that exists in the minds of some people against tube travel. Good lighting also conduces to safe working and reacts favourably on the health of the staff. It is not to be measured solely by the amount of illumination, but is dependent on several other factors—the absence of glare, the

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LIGHTING EFFECT UNDER COVERED WAY.

LIGHTING EFFECT ON OPEN PLATFORM.

CHISWICK PARK STATION, METROPOLITAN DISTRICT RAILWAY.

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steadiness of the source of light, the nature of reflecting surfaces and the colour of the light.

Glare effect is usually produced by the source of light being in the line of vision and in comparison making the surrounding surfaces appear badly lighted, and it frequently accompanies limited headroom unless special steps are taken to avoid it. (The slow adjusting power of the eye is very clearly illustrated by looking at a strong light, like the sun, and then immediately diverting the view to some other object.) This effect can be overcome by raising the source of light out of the natural angle of view, and by special globes or fittings causing diffusion.

The view of Boston Manor Station reproduced provides a good illustration of glare effect. Compare this with the photograph showing the lighting of the covered portion of Chiswick Park platforms. The lamps are kept high up and behind the vallance, and therefore out of view. The third illustration is also of Chiswick Park, showing the uncovered portion of the platform. The same effect is aimed at, although in this case the lamps are not entirely out of sight. The angle, however, is sufficiently high to avoid any pronounced glare effect, and the lighting of the platform surfaces and the general effect is good.

LIGHTING ON "LOOP" PLATFORM AT CHARING CROSS, LONDON ELECTRIC RAILWAY.

There has been a radical change of platform lighting on the tube railways. Under the original system arc lamps were installed, and owing to the low headroom there was a big difference between the intensity of light under a lamp and that between lamps. A system of semi-direct lighting by incandescent lamps was substituted as shown in the view of the loop platform at Charing Cross. The c.p. is lower than was provided by the arc lamps, but the lighting is uniform throughout, and therefore more satisfactory. A large saving in operating costs has been effected by this change.

The nature of surrounding surfaces materially affects good lighting; in the case of platform surfaces, for instance, there is a noticeable difference between granolithic or light stone as compared with an asphalte covering, the asphalte reflecting hardly any light. The same effect will be seen at a station where dark advertisements are posted on the walls or above the tracks as compared with surfaces posted with light-coloured bills or whitewashed. Whitewash has a very high reflecting power, about 90 per cent. of the light being reflected, which is one reason for its marked effort in improving the appearance of the stations.

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Early Gauge Conversion on the Great Western Railway.

OWING to the magnitude of the undertaking, the gauge conversion carried out on the Devon and Cornwall lines of the Great Western Railway in three days—May 20, 21, and 22, 1892—has necessarily attracted most attention. Indeed, the length of the track involved and the fact that the work had to be done under high pressure and within a minimum time, render this an undertaking of unique interest.

Gauge conversion had, however, been in progress on the Great Western Railway for many years previously, and it is just to acknowledge that, had it not been for this earlier experience, it would hardly have been possible for the proceedings of those three busy days in May, 1892, to have been carried out so successfully.

It was in 1846 that the Gauge Regulation Act, which, in a sense, sounded the death knell of the broad gauge, received the Royal assent, but many of the lines then under construction or projected by the Great Western Railway or by railways in association therewith, were exempted from this Act, which otherwise ordained that the standard gauge for Great Britain was to be 4 ft. 8½ in. Among the exempted lines was the South Wales Railway, leased to the Great Western section by section as it was opened. As the railway system of the country became more and more complete, however, the difficulties involved by the connecting together of broad and narrow gauge lines gradually became more and more acute, and in 1868 the Princes Risborough and Aylesbury line, 7 miles in length, inaugurated the process of conversion from broad to narrow gauge.

This was, however, a small, isolated section, so that the first important conversion is that which followed. This was the line from Grange Court to Hereford, 22½ miles in length, originally constructed by the Hereford, Ross and Gloucester Railway, and opened June 1, 1855. At Hereford connection was made with the West Midland Railway to Worcester, associated with the northern system of lines owned or leased by the Great Western Railway, most of which were of narrow gauge.

Before this work was undertaken the section between Gloucester and Grange Court was provided with a third rail, by no means a small undertaking, seeing that the extensive yards and sidings at Gloucester were involved, while there was at that time only a single platform at Gloucester for all passenger trains. The narrowing of the Hereford-Grange Court section was then taken in hand. For this purpose the line was closed and a service of omnibuses (some of them taken from the London routes) was arranged to convey passengers locally. This service commenced on Monday, August 16, 1869, but on the previous Saturday three special trains conveying workmen were sent to Hereford together with a train of broad gauge covered goods wagons equipped to serve as sleeping quarters, with a first-class carriage to accommodate the officers in charge.

Work on this section involved many complexities in that there are several tunnels and many curves, while five or six different descriptions of permanent way had been laid at various times. This necessitated workmen of varied experience and the use of different classes of tools and appliances. The procedure adopted was to divide the line into lengths of about 4 miles for each day's work, this being again sub-divided into quarter-mile sections. The staff train was first sent through the section allocated to that day, depositing each gang of men at their appropriate stations, together with their appliances and supplies. The train then remained at the broad gauge end of the section, the men eventually returning to it by a narrow gauge train, which followed them up at the end of the day's work.

The conversion was completed in six days, and two days were devoted to general overhaul, repacking, completion of station yards, and detail work, so that

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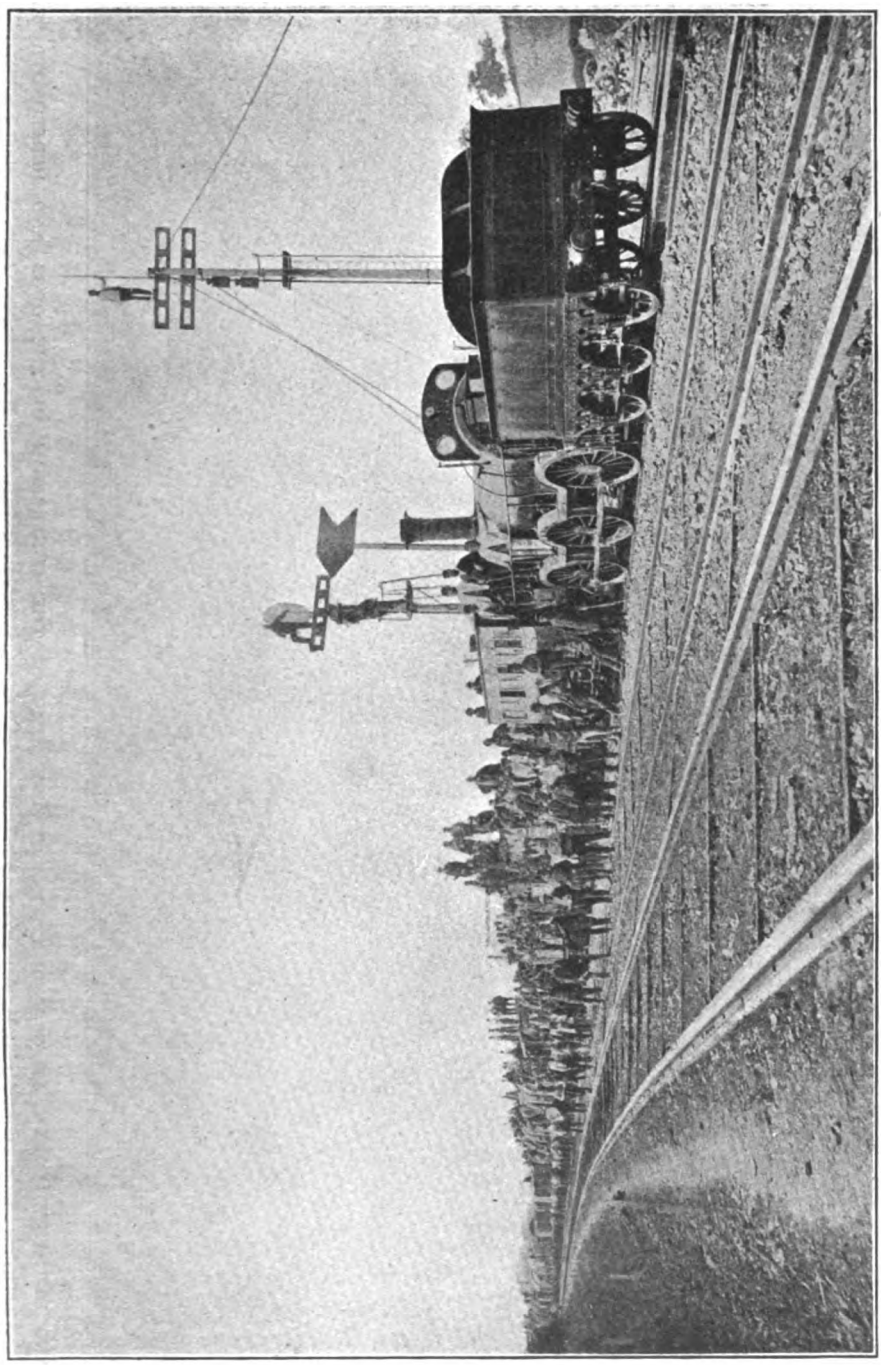

STAFF TRAIN USED IN CONVERTING THE SOUTH WALES RAILWAY FROM BROAD TO NARROW GAUGE.

From a photograph taken at Grange Court, May, 1872.

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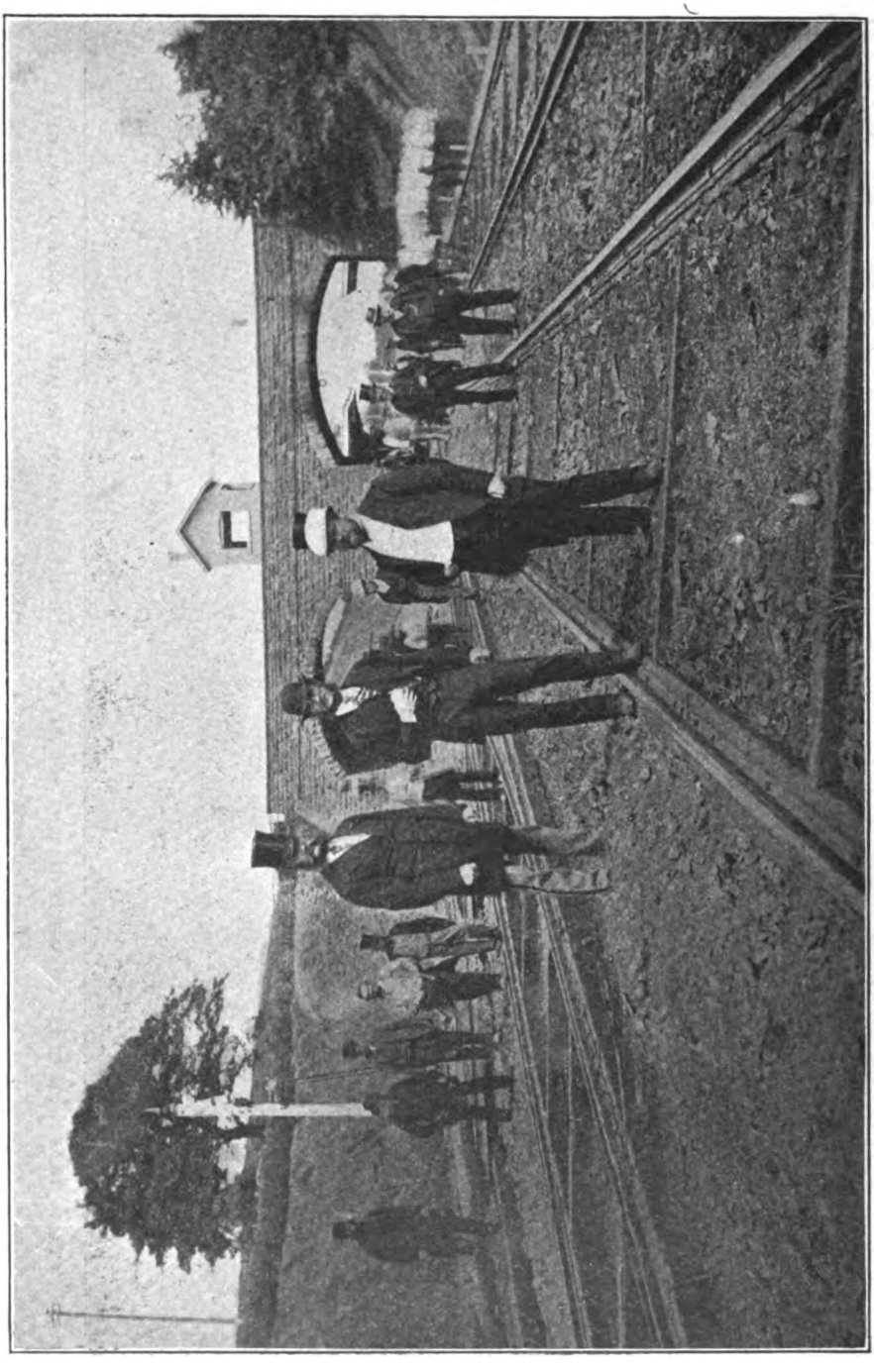

ANOTHER VIEW TAKEN AT GRANGE COURT AT THE TIME OF THE CONVERSION OF THE ROSS AND HEREFORD LINE.
Among those included are Mr. J. W. Armstrong, then Divisional Engineer, Hereford, G.W.R., and Mr. Lancaster Owen, Assistant Engineer.

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on the following Monday, the ordinary train service was resumed with narrow gauge rolling-stock.

During 1872 the South Wales Railway and the Vale of Neath and Merthyr Tydvil sections, together with the line from Grange Court to Cheltenham (involving together more than 300 miles), were converted to narrow gauge, but in places a third rail had already been laid, and where this applied the difficulties were, of course, much less severe. Most of these lines were laid with longitudinal sleepers, so that the complexities involved by the various trial lengths upon the Hereford, Ross and Gloucester line did not apply so seriously. On the other hand, through the busy districts of South Wales there were, in many instances, extensive sidings and numerous points requiring attention.

Two interesting illustrations from photographs kindly lent by Mr. H. R. Campfield, the present Gloucester Divisional Superintendent, Great Western Railway, are reproduced. One shows the staff train provided for workmen, as above described. This view includes the carriage provided for the officers in charge, together with the miscellaneous vehicles supplied for the use of the men employed. Several of the old type signals in use at that period are also visible. The second includes the chief officers concerned, Mr. J. W. Armstrong, then Divisional Engineer at Hereford; Mr. Lancaster Owen, then Assistant Engineer, together with Mr. R. Luke and Mr. J. Folley. It is interesting to note that both Mr. Armstrong and Mr. Lancaster Owen became in due course Chief Engineers for the whole of the Great Western Railway system.

PICTURESQUE RAILWAY SCENERY IN JAPAN.

WESTERN APPROACH TO KUTSUBAMI TUNNEL ALONG THE MOGAMI RIVER, SHINJO LINE.

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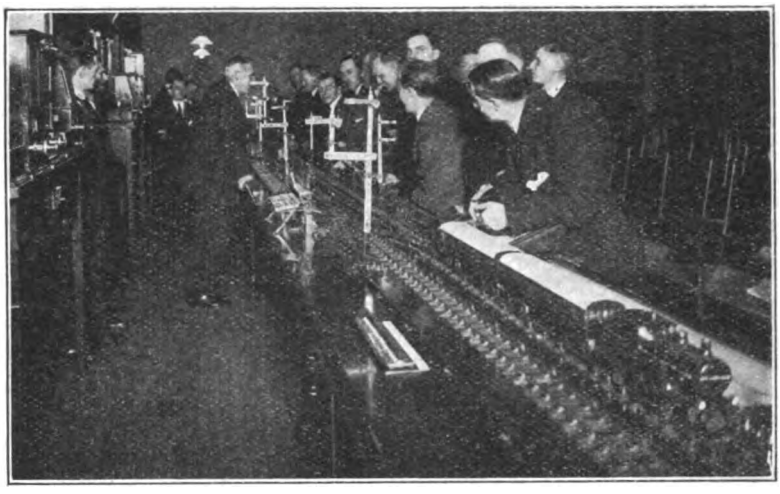

INSTITUTE OF TRANSPORT CONGRESS AT MANCHESTER.

Visit of Delegates to Lancashire & Yorkshire Railway School of Signalling, January 28.

The Work of the Lancashire & Yorkshire Railway School of Signalling.

By HILLYARD BRUCE

[*The author was winner of the First Prize, in Class A (Honours), in the examination following the conclusion of the* 1919–20 *session of the school, gaining* 380 *marks out of a total possible of* 400.]

THE scheme of training at the Lancashire and Yorkshire Railway School of Signalling includes seven classes: (*a*) Preliminary, (*b*) Intermediate, (*c*) Advanced, (*d*) Honours (*e*) Signalmen, (*f*) Passenger and Goods Guards, and (*g*) Stationmasters, the last three being allocated to the respective grades in the service. Other workers, of any grade, except those specially provided for, may attend the Preliminary class, and by satisfying the examiner at the end of the session, they qualify for admission to the Intermediate Class the following session, and similarly pass from the Intermediate Class to the Advanced, and finally to the Honours Class.

Sessions commence in September and terminate about the end of March each year, classes being held weekly in each section, and students are allowed, if necessary, and at the discretion of the head of the department to which they are attached, to leave duty in time to attend the classes.

The lectures to all classes are given two weeks in succession to allow students who work alternate early and late turns of duty to attend whichever week is most convenient.

The text-books used are the Company's book of Rules and Regulations, the book of regulations for train signalling by block telegraph, the wrong-line order booklet, and the working time book appendix. Students do not incur any expense for books or tuition.

Students of the Preliminary Class are instructed in the use, functions, and definitions of signals of all types used by the Company, and both model and standard signals are available for illustration. The lecturer then introduces to their notice the Block regulations as far as Rule 12. Block Regulations Nos. 13 to 24 are proceeded with in the Intermediate

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Class, and the previous year's work reviewed.

Advanced Class students study the Block Telegraph Regulations as far as No. 37, which embody absolute block working on double lines of railway, and also deal with wrong-line orders and single line working. The Honours Class are instructed in permissive working on goods and loop lines, terminal station working, station yard working, and Rule 55. The various instruments and appliances provided for use in connection with Rule 55 are examined and fully explained. Honours students also review the whole of the block, &c., regulations dealt with at the Preliminary, Intermediate and Advanced Classes.

Signalmen discuss the block regulations generally, paying special attention to the emergency clauses, and new rules are studied, and their application at places involving special treatment or methods are discussed. Passenger and goods guards study the various phases of Rule 55 and the emergency clauses of the block regulations. For instance, Rule 14, "Section obstructed by accident or disabled train" is taken in conjunction with Rule 217 of the company's Rule Book, "Protection of train when stopped by failure or accident." Operation of the vacuum brake is also explained. Stationmasters take the block regulations, single-line working, electric tablet and other methods of working on a single line of railway, fog-signalling arrangements and any other matters in connection with, and arising from, these regulations.

At an ordinary class, the lecturer states which rule is to be dealt with, and, reading it through, along with the students, explains each point as he goes forward. Then the application of the rule is illustrated by an example on the model railway in the School, and students act as guards, drivers, firemen, signalmen, &c. They are required to carry out the provisions of the rule, as far as they can (under the supervision of the lecturer), from the knowledge they have obtained from the lecture. Immediately the lecturer notices a mistake, he stops the operation and asks the students what is the correct method according to rule. On receiving a proper reply, operations are allowed to proceed. If, however, the proper reply is not forthcoming, he (the lecturer) refers the students to the particular rule, explains it again, and shows what might happen if the rule were not strictly adhered to.

These demonstrations on the model installation, together with the lecturer's and students' comments, criticisms, and corrections, serve to impress the rules on the minds of the students far more than many hours of reading and study without illustration.

Practically any operation can be illustrated on the model railway, for instance:—

- Ordinary train signalling;
- Junction train signalling;
- Obstruction of line, by failure of train or accident;
- Train divided;
- Vehicles running away in wrong or right direction;
- Opening and Closing of signal-boxes (Switches are provided);
- Failure of instruments or bells;
- Permissive working on goods or loop lines;
- Single line working, with or without junction pilotman;
- Rule 55, bell communication, with or without reply;
- Train on track-circuited portion of line; and
- Interlocking block.

When the demonstration on the model is completed, the lecturer gives the students an opportunity of asking questions. These are usually indicative of much thought and deliberation. If a verbal reply affords sufficient explanation this is given, but very often, and frequently at the desire of the questioner, an answer is given by an illustration on the blackboard, or on the model, accompanied by the lecturer's remarks and as much information as he can give. All the students thus get the advantage of the question and the reply. These lectures are both instructive and interesting, and it is found a much easier method of acquiring knowledge than reading the rules at home.

The lecturers are men who have had experience in signalling, etc., arrangements. One of them, Mr. J. White, is the Lancashire and Yorkshire Railway Company's Chief Block Inspector, and the students gain great advantage from the experience of these gentlemen.

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Towards the end of the session, say at the first lecture in March, the lecturer reviews the whole of the session's work, and briefly touches on the various important points arising, to prepare them for the examinations to be held at the end of the session. When the examination day arrives, it means a hard day's work for the students, especially those in the higher classes, and in the lower classes too, even, for the questions set are usually very difficult, and deal with the most complicated rules. It may be judged that when a student gains a fair percentage of marks for any question he has paid attention to the lectures during the session and worked hard to prepare for the examination.

One question which regularly figures in varying form is to this effect :—" Write all you know of Rule 5—The Warning Arrangement." It is a very great favourite with lecturers and examiners alike, and often a very difficult problem with the students, more especially those in the Preliminary and Intermediate Classes. The lecturers make such a point of the " Warning Arrangement " that by the time a student reaches the Advanced or Honours Classes, he should almost be able to give a lecture on it himself, at least to the Preliminary Class.

But this is as it should be. The " Warning Arrangement " is one of the most important methods of moving goods trains in operation on the Lancashire and Yorkshire Railway, and when one examines a map of the system and considers the number of stations and junctions, and the traffic to be moved, the fact is immediately apparent.

All Honours Class students may, on application, be granted permission to visit a signal box for the purpose of gaining actual experience in block working. When a student passes the Honours Class examination he may attend the Honours Class lectures in succeeding sessions as long as he wishes, or he may attend any other class, except the stationmasters', and by so doing he becomes acquainted with all alterations in, and addition to, the rules, which are made from time to time.

The School of Signalling model railway is ideal for demonstration, and practically every modern appliance is installed. Some of the appliances are standard, and as actually used on the line, and others are miniature. Alterations of and additions to the appliances are made from time to time, in accordance with those introduced on the system, and the model railway is thus constantly kept up to date.

A few personal remarks may here be given. When I entered the Company's service I was given a Rule Book, and read that " All persons must make themselves thoroughly acquainted with, and will be held responsible for a knowledge of, the whole of the following rules," and I experienced a severe shock. When first attending the School of Signalling I thought it very uninteresting to have to remember that a distant signal must be a given distance from the home signal, except in circumstances, &c., but after a very short time we passed on to rules which appealed more and which could be demonstrated on the model. The lecturer explained why certain points should be carefully noted, and what would happen if the rules were not properly carried out, and as a matter of interest, related incidents which had come to his notice (sometimes amusing), where irregular block working had occurred. I believe that the majority of the men who attend the School of Signalling would never otherwise have known half they do about the regulations, even if they had the determination to study the rules themselves.

I have found, too, that the interest aroused in the minds of the students by the lectures makes them more on the alert to notice any point of interest in connection with the workings at their stations, and more conscientious in their own work, especially those who are engaged in train movement and operation. To some extent, too, students of the School of Signalling are in a more favourable position as regards promotion, because the officers of the Company recognise that the School of Signalling lectures are an education in themselves.

The Chairman of the Directors of the Lancashire and Yorkshire Railway recently made it clear that the directors and shareholders were very anxious to improve the efficiency of the staff, and in this connection they were prepared to spend what money was necessary to keep the School of Signalling the up-to-date and necessary institution that it is.

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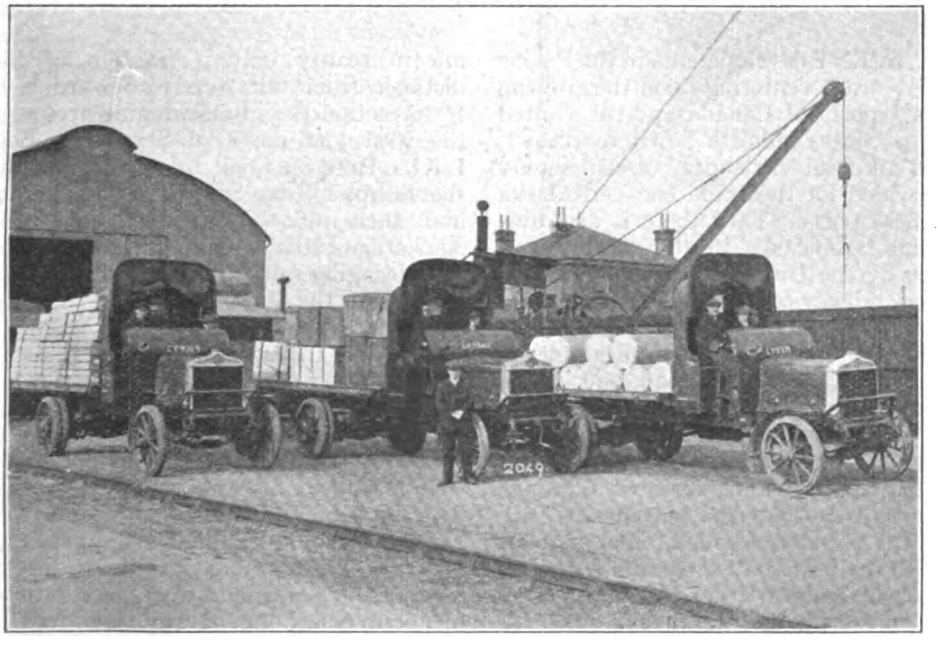
Mr. Ashton Davies, M.B.E., the present Superintendent of the line, used to be the foremost lecturer, and he still retains a great interest in the School and the students.

I would like to say that in my opinion a School of Signalling is invaluable, almost indispensable to any "Go-ahead" railway company, which seems to amount to saying that the efficiency of a railway staff is incomplete without it. To my mind, the staff who do not attend are to a great extent in a similar position to the signalman our lecturer once referred to in a short story, something after the following :—

The District Block Inspector was newly arrived in the district and he went to the various stations to examine the signalmen. He arrived at one box, and after examining the man there he was told that the signalman at the box ahead was an expert on the rules, and well prepared for the Inspector's visit. This aroused the inspector's curiosity, and he made his way to the next box, to examine that particular man. On his arrival, he commenced to question the signalman on sundry rules, at random, and was surprised to find that the man was hopelessly beaten and gave no correct replies. On remarking what a good report he had had of the man from his neighbour, and expressing his astonishment at finding it obviously incorrect, the inspector received the reply :—"You started in the middle of the rules and I could not remember the correct answers, but had you asked me, I could have recited them from beginning to end without an error."

Finally, I would mention that it seems to me a better plan to spend money in educating the staff by means of Schools of Signalling than to spend more in compensation and replacements of damaged stock and property consequent upon accidents arising through the ignorance of the staff. From various reports one hears, on different occasions, one is not likely to question the statement that Lancashire and Yorkshire Railwaymen know the Rule Book thoroughly, and the School of Signalling appears to be the principal contributing factor. I consider that attendance at the School of Signalling should be compulsory for certain grades, especially those concerned in any way with train operation.

A.E.C. MOTOR LORRIES IN GREAT WESTERN RAILWAY SERVICE.



A TYPICAL GOODS YARD, SCENE OF TO-DAY.

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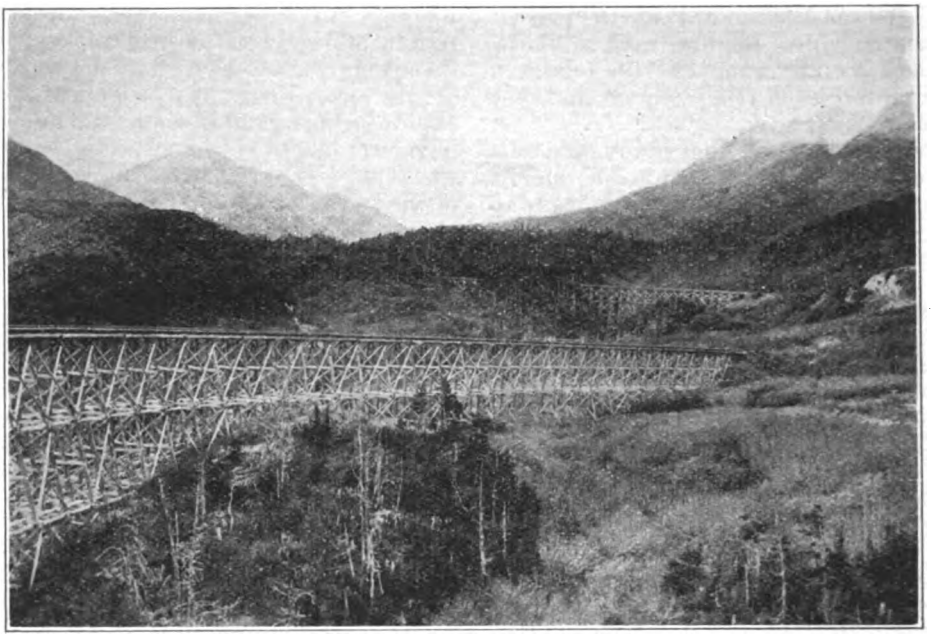

NOTABLE BRIDGEWORK ON THE SEWARD DIVISION.

A New Alaskan Railway.

COMPLETION OF NEW LINE BY THE UNITED STATES GOVERNMENT.

RECENT developments in the Pacific trade centering upon the growing ports of Canada and the United States indicate how important it is that an abundant supply of coal should be provided for the trade between Alaska and these ports. Thus there is an international significance in the recent completion by the United States Government of a new railway connecting the Matanuska coalfields with tidewater.

The new line constitutes an extension of the Alaska Central Railroad, now known as the Alaska Northern Railroad. When taken over this line consisted of 71 miles of road starting at Seward, the tidewater terminal, and extending northward, though it was still short of the Matanuska coalfields, the product of which ranks as about equal to the best coals mined in Virginia.

As will be seen from the map reproduced, although the Matanuska coalfields are nearly 200 miles from Seward, yet they are in reality only a fraction of that distance from salt water. Seward is on Resurrection Bay, but swinging around to the west and north of Seward is Cook Inlet. Here on Cook Inlet, 100 miles up the railroad from Seward, is Anchorage, and then off to the north-east from Anchorage extends Knik Arm for 40 miles, thus bringing salt water to within a short distance of the Matanuska coalfields.

Knik Arm, is not, however, navigable continually throughout the year, so that it was necessary to commence at Seward, although the U.S. Government has extensive plans for improving Anchorage so as to eliminate the long haul between that place and Seward, including a wharf 80ft. high on the Anchorage water front. This remarkable height is made necessary because of the change of 42 ft. in the level of the water, and to give a minimum of about 6 fathoms of water at low tide. This wharf, 1,000 ft. long, is to have wings

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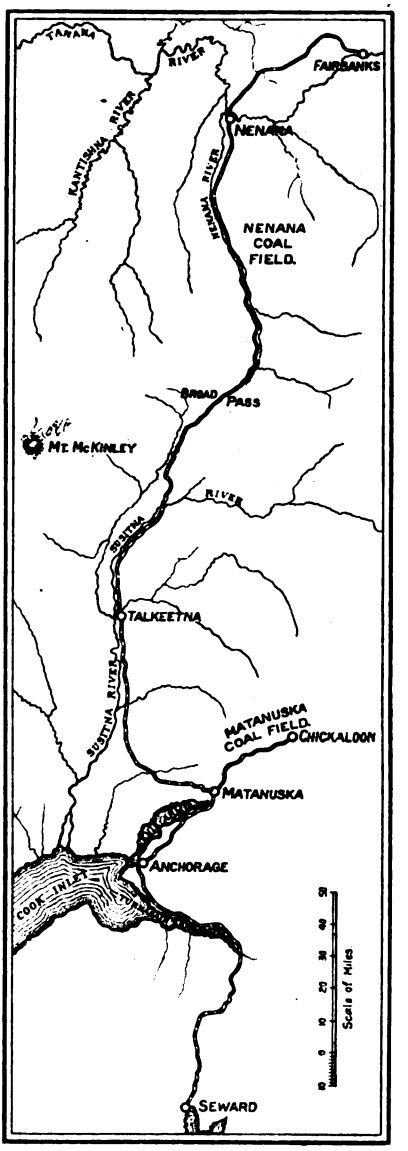
running obliquely to the shore from each end, these wings to be each 1,500 ft. long. These and associated works will, however, take considerable time and involve complicated constructional and equipment operation. Meanwhile the older Alaska Northern Railroad has been improved and strengthened, while the extension to the coalfields provides through connection with Seward.

Just as Knik Arm strikes off to the north-east from Anchorage, so Turnagain Arm strikes off to the south-east, and it is along this latter branch that some of the most difficult construction work on the whole line has been required. Deep embankments and gulches are of frequent occurrence. In order to avoid making highly expensive cuts in the steep and rocky bluffs it was necessary to make heavy fills, the slopes extending down into the waters of Turnagain Arm where they are affected by the heavy tides.

Along Turnagain Arm it has been necessary to excavate more than 1,000,000 cubic yards through solid rock. Dozens of timber culverts and small trestle openings were required, and in many places truss bridges had to be built over the larger streams. The disastrous slides that start from long distances up the cleared mountain side are a constant menace to railroading along Turnagain Arm. It will be necessary to build about 2 miles of snow sheds to protect the track from these slides, and these sheds must be sturdy and substantial enough to withstand the tremendous impact.

Railroad construction work in Alaska is seldom free from its obstacles, and in some sections there are special difficulties that make the work doubly toilsome or dangerous. For instance, as late as April, 30 in. of snow covered the ground in the Talkeetna district, 100 miles north of Anchorage. Farther north little work could be done until June because of the snow. Snow slides are often followed by rock slides or mud slides, and when these are not active a flood can be readily staged that will wipe away a whole month's work in a single minute.

The floods around Nenana, in the Fairbanks district, 400 miles inland, were particularly destructive, causing many bad washouts, and putting out of commission several miles of track. The havoc wrought by these floods made it obligatory to change the line. It was accordingly removed 2 to 2½ miles east of the original location. On the Fairbanks division nearly 10,000 lineal ft. of piling



MAP SHOWING ROUTE OF ALASKAN RAILWAY.

was driven to keep the floods from damaging the road bed on the break-up of the Tanana River.

To reach Fairbanks from Anchorage the railroad has to pierce the mountains

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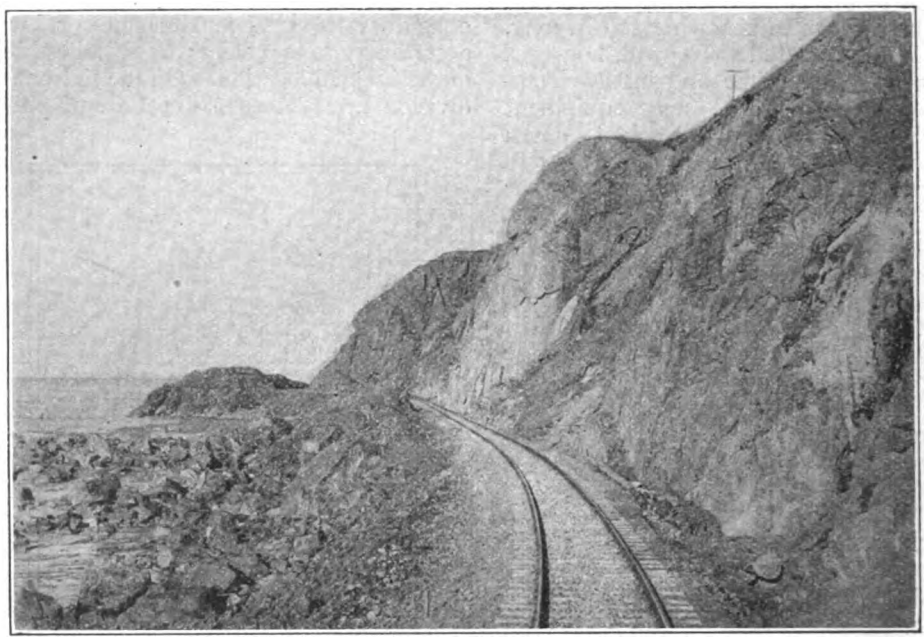
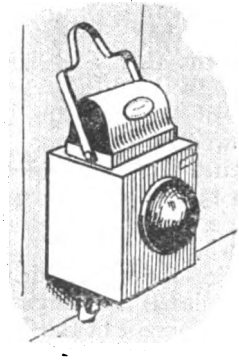


TURNAGAIN ARM, ANCHORAGE DIVISION.

or round them. The builders preferred to pierce the mountains. Chulitna and Broad Passes were selected for this purpose. Broad Pass is the highest point on the line. Here an elevation of 2,319 ft. is reached at a distance of 314 miles from Seward. The route follows the valley of the Nenana River down to a point near the junction of this stream with the Tanana River, which empties into the Yukon.

No grade on the line exceeds 2 per cent.; in fact, 1 per cent, is the maximum grade over the greater part of the route. It is fortunate that the low elevation at Broad Pass was available, otherwise deep snows would undoubtedly tie up the line throughout the winter months. It must be remembered that the southernmost point of this line barely reaches down to the 60th parallel of latitude.



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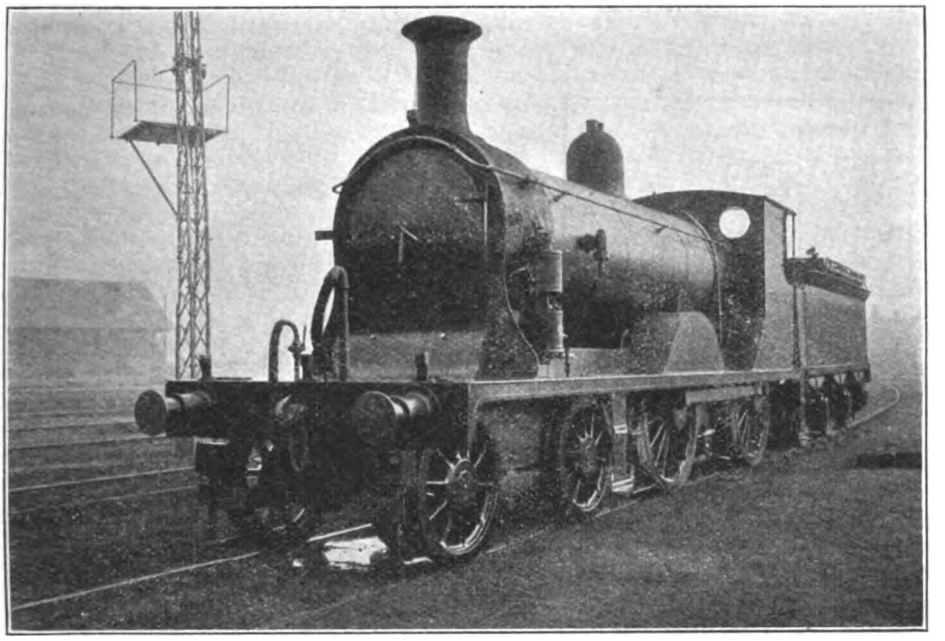

4-4-0 MIXED TRAFFIC ENGINE NO. 441, FITTED WITH FOG SIGNAL INDICATING AND RECEIVING APPARATUS.

Indicating Fog Signal Detonations.

AN INGENIOUS APPARATUS ON TRIAL ON THE LONDON & SOUTH WESTERN RAILWAY.

AS generally applied the method of ensuring safe running in fog by the use of detonators has fully justified itself, and it is but rarely that a fog signal fails to explode, or should it do so the enginemen are usually sufficiently on the alert to avoid disaster. A certain amount of uncertainty is, however, unavoidable with this method, and experiments have therefore recently been carried out on the London and South Western Railway with a system devised by two officials of that Company for conveying the effects of the exploding detonator to the cab of the engine, giving a visible and audible indication and applying the brake.

Unless a train stop system such as may eventually become standard is based on continuous action along the whole length of a railway, such as continuous track circuits or some continuous inductive method, and until the whole of the railways are equipped therewith, it will be necessary to retain the use of the detonator. The majority of the train control systems now in use, or under review, are based on the bar, ramp or treadle principle, which leaves the parts of the line between the bars or ramps without special protection. and in the case of a train parting or failing between block posts, it would still be necessary to put down detonators to protect trains. Hence the importance of this development, notwithstanding the progress which may yet be made with train control and other special systems of working.

The apparatus has been fitted to 4-4-0 mixed-traffic engine No. 441, and many trials have been made with very successful results.

The system provides for ultimately

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and the circuit being completed, the normal position of the indicators is maintained.

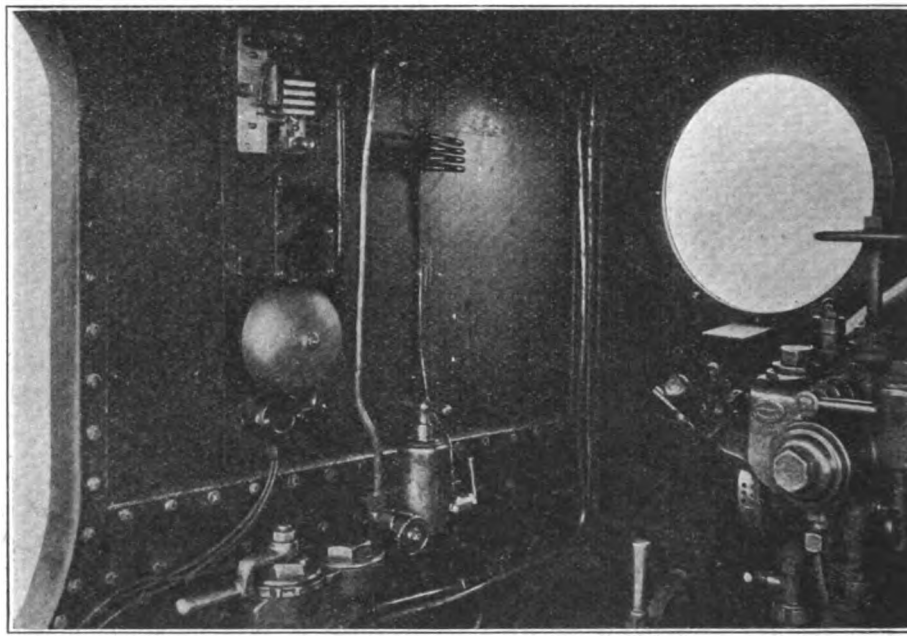
Engine No. 441 is fitted with the visible and audible indicators only, the audible indication being a loud-sounding electric bell, which is brought into action by the armatures of the visible indicators falling on to the bottom contact and completing the local circuit. The receiving apparatus has a wide range of sensitiveness, but in practice it is so arranged that the results of the explosions operate only through the mouthpiece immediately above the detonator; consequently a detonator exploding on an adjacent line will not affect the apparatus on an engine 6 ft. away.

The mouth of each tube is arranged parallel with the surface of the rail, so that there is no air-suction, whether the engine is running forward or backward, and a minimum amount of dust collected. After running in service for several months practically no dust had been found in the pipes.

A receiving mouthpiece and pneumatic chamber have been connected to each of the four corners of No. 441 engine and tender, to meet the conditions of running engine or tender first, and whether the detonators are placed on the right or left-hand rail.

The four receiving mouthpieces are connected to one pneumatic chamber and pneumatic switch, so that the results of the explosions are received through any one pipe. A system of valves in the other three pipes operates to concentrate the results of the explosion in the pneumatic chamber.

The vibrations received and passing to the pneumatic chamber are sufficiently powerful to lift the spring and break contact, and to obviate the conflicting effect of the running vibrations of the engine at high speed and when passing over points and crossings, an ingenious device is employed. The pneumatic chamber 7, spring 8 and contact 9 are mounted on a flexible spring or rubber tube, so that, no matter what amount of vibration takes place, the parts of the pneumatic switch, viz., the pneumatic chamber, the contact and contact spring, all vibrate relatively one to the other, with the result that the contact 9 is maintained unless spring 8 is raised owing to the expansion of the pneumatic chamber 7. Although the device appears delicate it is not affected by the rough treatment to which it is subjected under running conditions.



VISIBLE INDICATOR IN CAB, WITH COVER REMOVED, AND ELECTRIC BELL IN POSITION.

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Normally the visible indicator in the engine cab shows white, but when a danger signal, due to the explosion of a fog signal, is received, the flag of the indicator falls and a series of red and white lines appear, telling the driver that a detonator has exploded. At the same time an electric bell shown under the visible indicator continues to ring until the driver restores the apparatus by pushing in the resetting plunger fixed at the bottom of the indicator. Thus the apparatus is under the control of the driver, but he must operate the plunger to restore the apparatus to normal, or both the visible and audible indications will continue, and in the complete system the brake application would be maintained and bring the train to a standstill in the usual distance after the brake is applied.

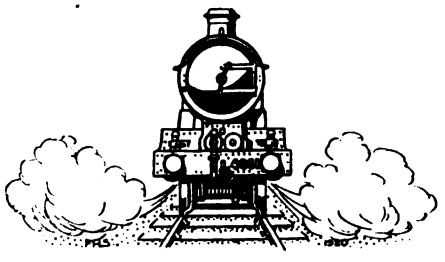
The apparatus has been run in service for weeks without attention, and then spasmodically operated twice on a journey, the apparatus giving the indications correctly. In the series of trials that have been made detonators of all British makes, also the French railway high explosive detonators and others, have been tried with success.

One special benefit claimed for this system is that it is in addition to the ordinary train stop or indicating devices; it is practically a *portable* train stop, as the detonators can be placed on the rails at any spot in cases of sudden emergencies, without previous preparation or notice, and when exploded will operate the apparatus and give the visible and audible indications in the cab of the engine and apply the brake.

The apparatus on the engine consists of a visible indicator, an electric bell, four pneumatic switch devices (which will eventually be reduced to one), four receiving pipes and mouthpieces, and the necessary electric wiring. The cost of this and the system will not be large, especially when it is considered that no apparatus beyond that already in use is required to be fixed on the permanent way. The absence of ramps, bars, treadles, and the reliance on electric current from the signal box on the ramps to give the correct indications in the engine cab is certainly a decided advantage. This is very much more so where the railway has been electrified and stray currents due to leakage and return traction power currents are always and everywhere in evidence.

Tests have been made to determine the limits of sensibility of the apparatus. when detonators of various makes, in each case containing 100, 90, 80, 70, 60, 50 and 40 per cent. of the usual explosive materials, were exploded under working conditions, the detonators being placed on the right and left-hand rails and the engine running boiler and tender first at speeds varying from 25 to 60 m.p.h. Every explosion of the detonators was recorded in the engine cab. In one case the sound of the explosion was not heard in the cab of the engine, but the fact that the detonator had exploded was recorded.

The apparatus operated correctly with 40 per cent. of the ordinary explosive material in the detonator; there is therefore a margin of safety of 150 per cent. when using the ordinary fog signals.



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New Wagon Shops at Darlington.

NORTH EASTERN RAILWAY.

ADDRESSING the shareholders of the North Eastern Railway last year the Chairman, Lord Knaresborough, referred to the difficulties of meeting the wagon repair and construction demands of the system at the existing works at Shildon and York, neither of which was adapted for extension for this purpose. It had therefore been decided to erect a new central wagon-building establishment at Darlington, the present shops being devoted to repairs.

Although the imperative need for this development is of to-day, this step had been decided upon before the war, but a start had not been made, and no steps could be taken subsequently.

The new wagon shops are to be erected on a site to the north-west of the Chief Mechanical Engineer's offices at Stooperdale.

They will be of the most up-to-date pattern, designed with the object of the greatest possible economy in the work of wagon construction. Apart from the raw iron and the wood used in their construction, all parts of the wagons will be manufactured in the new shops.

At present the Company cannot build anything like the number of wagons they require, but with an output of 200 wagons per week, it is estimated that the new works will be able to supply all demands.

Houses for the workmen who are to be brought from Shildon and York will have to be provided, and it is probable that the Company will undertake this work.

A plan is reproduced on the opposite page showing the proposed lay-out of the works. The complete scheme embodies buildings for the construction of wagons and the manufacture of all ironwork except wheels and axles. That part of the scheme now to be proceeded with is for the construction of the wagons, and the shops for the manufacture of the ironwork will be left over to be constructed at a later date.

The plan shows the lay-out of the complete scheme, and the buildings indicated as Part 1 are to be taken in hand immediately. The contract for this work has been placed with the Cleveland Bridge and Engineering Company, Limited, of Darlington. The lay-out has been arranged in such a way as to give sufficient space to enable all the buildings to be increased by 100 per cent. if occasion arises.

At the annual meeting on February 18 last Lord Knaresborough also referred to this matter: A contract for the work has now been let at a cost of about £750,000. The choice of the board of directors lay between a policy of purchasing wagons and increasing their building establishment, and they felt no doubt that the latter was in the long run the more economical course.

During 1920 4,010 wagons were built in the company's works, and 4,568 were purchased outside, making a total of 8,578. In addition, 2,467 wagons which had been sent overseas during the war were returned. As against this the number of wagons broken up during the year was 4,511, leaving a net gain of 6,534 wagons. The number of wagons waiting for repair at the end of the year was reduced from 4,666 on December 31, 1919, to 3,188 on December 31, 1920. The total increase in wagons available on December 31, 1920, as compared with December 31, 1919, was 8,012 wagons. The percentage of disabled wagons at the end of the year was just under 2½ per cent. and the stock and the position are now practically normal.

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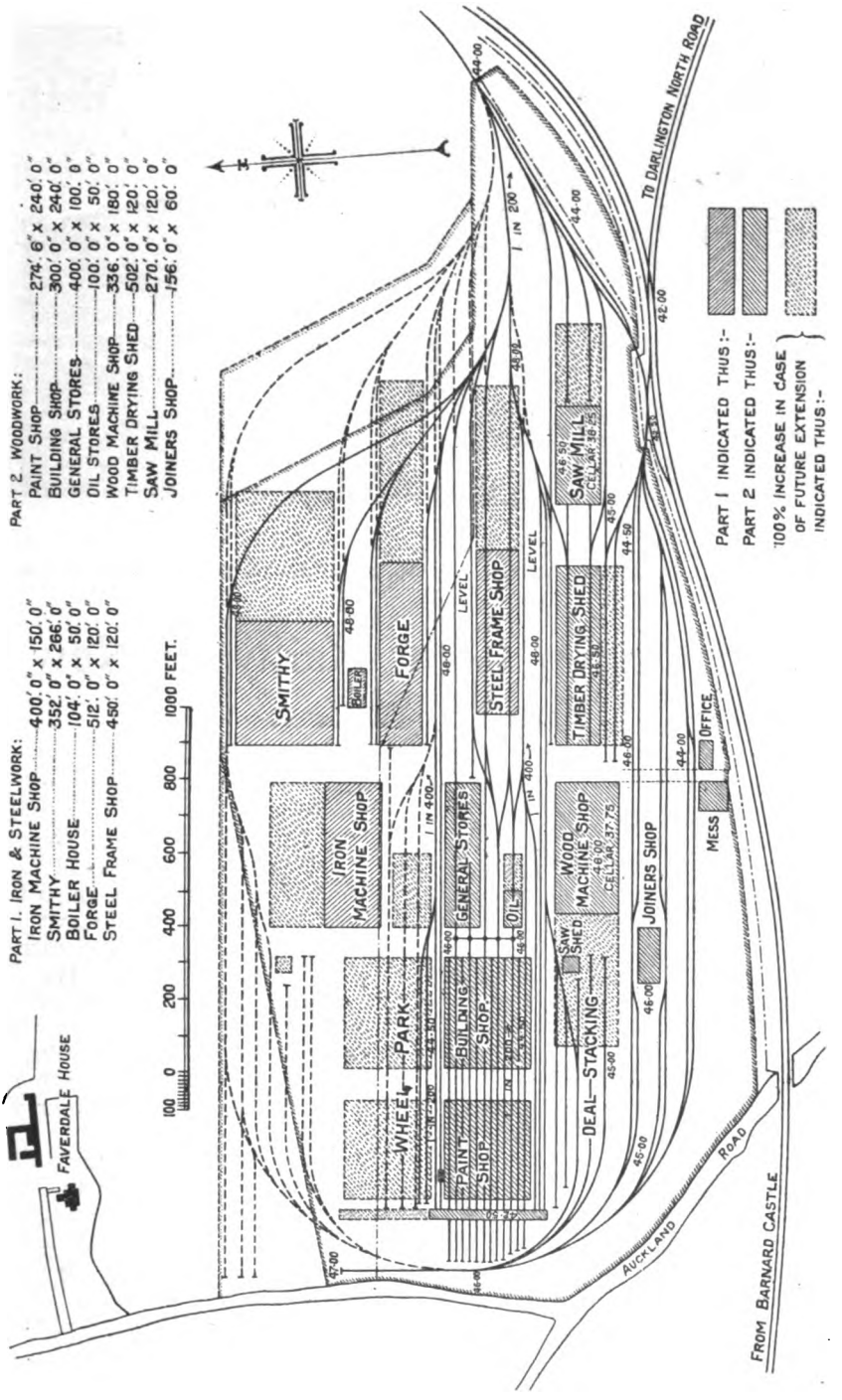

LAY-OUT OF NEW WAGON SHOPS AT DARLINGTON, NORTH EASTERN RAILWAY.

Part 1 to be constructed immediately; Part 2 to follow, and remainder to be built when extensions are necessary.

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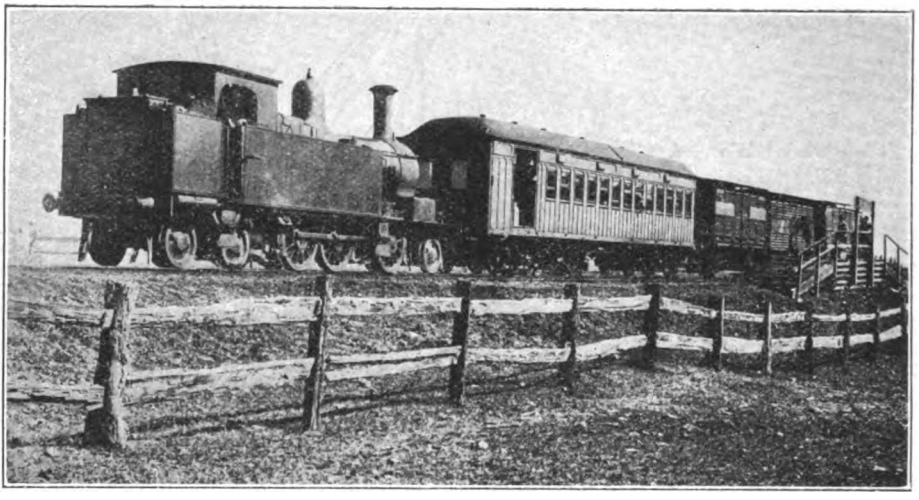

Photo.] [*C. F. Dewey.*

LOADING MILK AT RUDD'S GATE, A TYPICAL CONDITIONAL STOPPING PLACE.

The Camden Light Railway, New South Wales.

By C. F. DEWEY.

THE Camden Light Railway, or, as it is locally termed, the Camden Tramway, is a standard gauge line of light construction extending from Campbelltown, 33½ miles from Sydney, on the main Southern line, to Camden, 41½ miles from Sydney, and 8 miles from Campbelltown in a south-westerly direction. In this short run some of the finest pasture country of New South Wales is traversed, and on an early spring morning, such as the one on which the accompanying photograph was taken, a magnificent vista of green rolling hills is presented to the eye.

The district is served by 12 trains in each direction daily. Most of these are of mixed make-up, and are hauled by engines of class "E," the only type permitted to run on this line. These engines are of 2-6-4 tank construction and have a tractive effort of 19,440 lb They are conversions from an earlier type of 0-6-0 tender engines known as class "A," the alterations being carried out at the Eveleigh shops. The leading dimensions of "E" class engines are as follows:—Cylinders 18 by 24; Driving wheels 48½ in.; Total heating surface 1,322·18 sq. ft; Boiler pressure 150 lb.; Total weight in working order 61 tons 19 cwt.

Milk forms the bulk of the traffic, and louvred cars are attached to the trains for its conveyance to the city. Apart from the terminals, there are six sidings or conditional stopping places, and one permanent stopping platform. The line is operated on the staff system.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst. T.

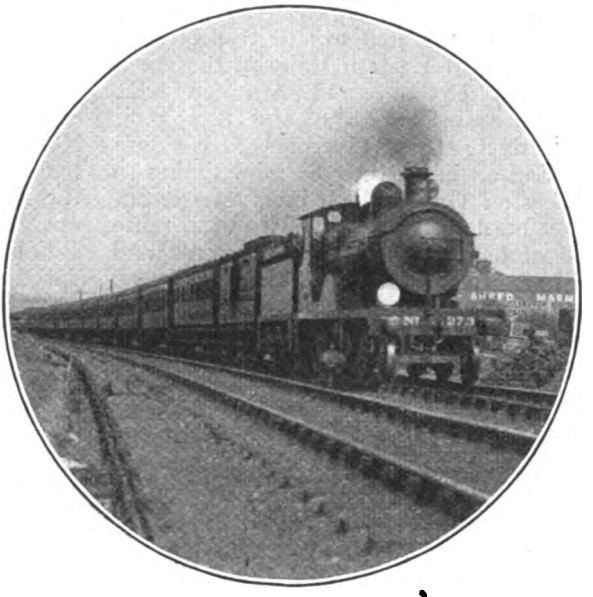

Photo.] [*E. A. Gurney-Smith.*

SOUTH EASTERN & CHATHAM RAILWAY.

Continental Pullman Express passing Bellingham on Catford Loop Line. 4-4-0 locomotive, No. 273.

ALL honour to the "Brighton" for being the first British railway company to return in speed to what is substantially a pre-war time-table. Last month I commented, at some length, on a leading article in the *Daily Telegraph* which referred in a congratulatory vein to the restoration of the "Southern Belle" express trains to their 60-minute run between Victoria and Brighton. Now these four trains—11 a.m. and 3.10 p.m. *ex*-Victoria and 1.20 and 5.45 p.m. *ex*-Brighton—are joined by the 5 p.m. from London Bridge, known as the "City Limited," and the 6.35 p.m. from Victoria. The only pre-war 60-minute train not so restored is the 12.20 p.m. up, which still retains its somewhat unaccountable time of 81 min., although the working time is, I believe, 5 min. less. But against this we have the acceleration of the up "City Limited" to a time of 62 min. to London Bridge, against the pre-war figure of 70 min., and I understand that the departure time would have been 8.50 instead of 8.48 a.m., and the schedule 60 min., were it not for the congestion at Brighton about that hour. These are no featherweight trains, the average loading, inclusive of passengers, being in all cases between 250 and 300 tons; in the case of the business expresses, which generally carry about 10 bogie vehicles, and are fully up to the 300-ton mark, the locomotive work required in the maintenance of this booking is of exceptional merit, as the Brighton main line, with its long banks, and especially its arduous start at the London end, is not an easy route to traverse on tight times. The Eastbourne service has also been materially accelerated; the 5.5 p.m. *ex*-London Bridge is restored to a run of 65 min. to Lewes and 90 min. to Eastbourne; the time of 5.20 p.m. *ex*-Victoria is cut to 91 min., and the 6.40 p.m. makes the journey in 93 min.; while in the up direction one may return at 8.33 a.m. in 92 min., at 9.30 a.m. in 95 min., and non-stop at 11.42 a.m. and 5.10 p.m. in 94 and 90 min. respectively. Many other trains are speeded up on their journeys.

On most railways there can be found occasional trains which have been restored to their pre-war running times. For instance, on the London and North Western the 8.30 a.m. down Irish Mail is on its pre-war schedule, with 85 min. allowed for the 77.2 miles from Willesden to Rugby, 87 min. thence to Crewe, 75.5 miles, and 102 min. for the 84.4 miles

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from Chester to Holyhead—averages of 54.5, 52.1 and 49.6 m.p.h. respectively. On the Great Eastern Railway the down Hook of Holland and Antwerp boat express trains, at 8.30 and 8.40 p.m. respectively from Liverpool Street, are running again on their 82 min. timing to Parkeston Quay, which involves exceedingly hard work over a 68·9 miles' route full of heavy switch-back gradients and with a number of severe service slacks. And this 50·4 m.p.h. booking must be maintained with loads in excess of the pre-war figure; since the addition of Pullman cars, the Hook of Holland train formation generally comprises a 12-wheeled Pullman, three "diners" and four corridor cars, all eight-wheeled, and one bogie and three six-wheeled brakes—total 47 axles, or about 300 tons tare weight. A number of other Great Eastern expresses are running on schedules equal to the best winter timings before the war, but the locomotive work required on the pre-war summer expresses of the Great Eastern Railway has always been very much in advance of anything called for in the winter, both in regard to load and speed, with the exception of the boat trains.

Elsewhere the South Eastern and Chatham Railway maintains its fine main line programme—materially better on the average than before the war, though the best trains do not quite equal in speed the crack timings of the pre-war period except to Hastings. In Scotland the North British Railway introduced in February a speeded-up train service on the Aberdeen route almost equal to that operating before the war, while the Edinburgh-Glasgow service has, in average speed, been for some time above the pre-war level; the Caledonian has a number of very tightly-timed trains north of Perth, including the splendid 34-min. run of the up "Postal" over the 32·5 miles from Perth to Forfar, as well as good bookings over other parts of the system, nearly at pre-war level; on the Glasgow and South Western line the best timings on the Ayr route, which were always the fastest on that system, have also been reintroduced. With all these more or less partial improvements, however, the principal British competitive services remain in the backward condition on which I wrote at length last month.

LONDON & SOUTH WESTERN RAILWAY.
Waterloo-Southampton Docks train passing Raynes Park.
4-4-0 engine No. 417.

It will be good news to speed enthusiasts, however, no less than to travellers generally, when I mention that the month of May next is probably to witness a great improvement; among other "cuts," the

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time from London to Glasgow and Edinburgh is to be curtailed to about 8½ hours; Manchester, Liverpool and Leeds are to be brought within 4 hours of town; and the London-Birmingham journey is to be reduced to one of 2¼ hours, inclusive of one or two stops *en route*. Better than this, the Chairman of the London & South Western Railway, in his speech at the annual meeting, promised a summer service this year which should be even superior to that operating in pre-war days. Substantial further improvements of the Brighton service also are foreshadowed, especially on the Portsmouth route.

which still remain are to go by the board, notably the confinement of London-Edinburgh passengers to the East Coast route, which at the present time is effective in reducing some of the chief West Coast expresses to five-coach and even four-coach formations over lengthy stretches of their journeys.

And now, without further preamble, I wish to turn to performance, as I find that constant travelling is occasioning aggregations of running data which will never see the light of publicity unless I make a determined effort to overtake the arrears. It is with the London and North Western Railway that I am concerned principally

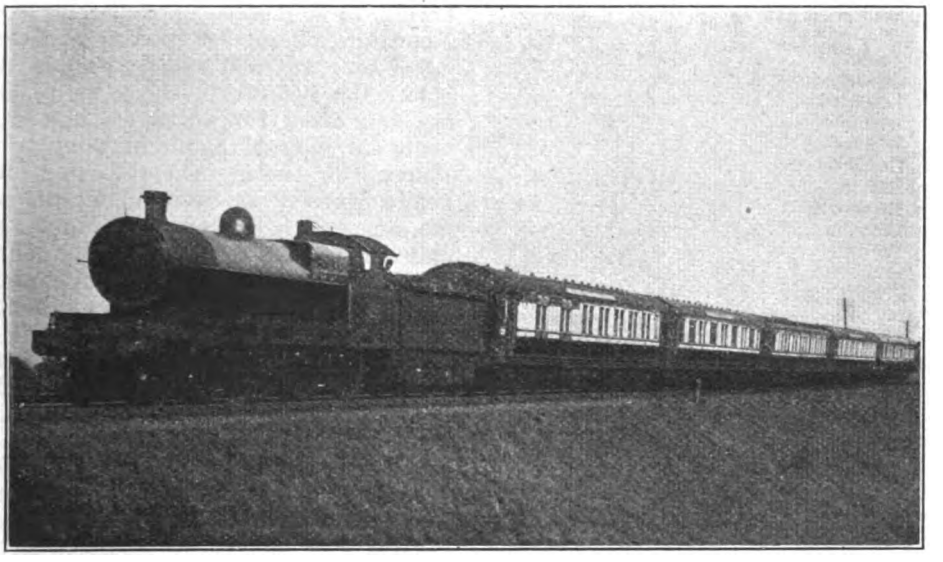

Photo.] LONDON & NORTH WESTERN RAILWAY. [*F. E. Mackay.*

1.15 p.m. down Anglo-Scottish express passing Penrith. Four-cylinder 4-6-0 locomotive, No. 986.

These, at least, are the proposals, if the uncertainty attending all railway enterprises at the present time does not come in to compel a less ambitious programme. Proportionately, of course, the improvement in the longest-distance services will call for the nearest return in overall speed to pre-war conditions, but as in most cases the expedited trains will include in their schedules more intermediate stops than previously, the actual running speeds will require to be pretty well up to the pre-war level. At the same time, I believe that certain of the most important "allocations" of traffic

this month, both as I have not dealt with the running on this line for some time past, and also because on a series of business journeys to and from Cumberland I have been favoured with quite a number of noteworthy performances.

By far the most remarkable was a trip on the accelerated down morning Irish Mail, when we were honoured with the presence of the Prince of Wales as a passenger to Rugby. Unfortunately there was a very severe fog from London out to Tring and also in the neighbourhood of Rugby, while the weather was distinctly misty throughout, with the consequence

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that Driver Buckland, on "Claughton" class 4-6-0 No. 194, while evidently anxious to do his utmost in keeping time, was badly hampered by the necessity for cautious running. The load comprised 10 eight-wheelers and 2 "diners," weighing 361 tons empty and 380 tons full. I give the run in tabular form, in order that the excellence of the work may be better appreciated. Owing to the initial delays we were 9½ min. late past Tring, but a fine spurt was then made, the ensuing 43·7 miles to Welton being covered in 41 min. 10 sec., at an average of 63·7 m.p.h. We touched 70½ m.p.h. beyond Cheddington, and 72½ at both Bletchley and Wolverton; the minima at Roade and Kilsby were 54 and 55 m.p.h. respectively, while the intervening maximum near Weedon was 66 m.p.h. But for the serious delays outside Rugby, we could have easily effected an arrival in 85 min. from Willesden, as booked, despite the delays up to Tring, from which point our net gain on schedule was 4¼ min.

Engine 194: 4-cyl. 4-6-0 "Claughton"
Driver: Buckland, Camden Shed.
Load: 12 cars; 52 axles.
Tons: Tare 361, Total 380.
Weather: Thick fog to Tring and Rugby to Nuneaton.

Miles.			Sched. min.	Actual. m. s.
0·0	Willesden Junction	dep.	0	0.00 (*a*)
26·2	Tring	pass	31	35.20
30·7	Cheddington ..	,,	—	39.50
34·8	Leighton	,,	—	43.25
41·3	Bletchley	,,	46	49.00
47·1	Wolverton	,,	—	54.00
49·4	Castlethorpe ..	,,	—	56.05
54·5	Roade	,,	60	61.25
57·5	Blisworth	,,	—	64.30
64·4	Weedon	,,	—	70.55
69·9	Welton	,,	—	76.30 (*a*)
77.2	Rugby	arr.	85	88·30
0·0		dep.	0	0.00
14·6	Nuneaton	pass	17	21.50
19·8	Atherstone	,,	—	27.35
23·9	Polesworth ..	,,	—	31.35 (*b*)
27·5	Tamworth	,,	31	35.15
33·7	Lichfield	,,	—	41.30
38·5	Armitage	,,	—	46.25
41·7	Rugeley	,,	46	49.20
44·6	Colwich	,,	—	51.55
47·0	Milford	,,	—	54.10 (*c*)
51·0	Stafford	,,	57	58.15
54·3	Great Bridgeford ..	,,	—	61.45
56·3	Norton Bridge ..	,,	65	63.50
60·9	Standon Bridge ..	,,	—	68.25
65·0	Whitmore	,,	74	72.30
67·6	Madeley	,,	—	75.10
70·8	Betley Road ..	,,	—	77.50
73·3	Basford Sand Box..	,,	—	80.00
75·5	Crewe	arr.	87	83.45

(*a*) Signal and fog delays.
(*b*) p.w.r. check, Polesworth.
(*c*) service slack, Trent Valley Jc.

No less fine work was performed beyond Rugby, after we had got through the fog area at Nuneaton. In fact, it was still more noteworthy, as we gained 8 min. between Nuneaton and Crewe, inclusive of a p.w.r. check at Polesworth. This, by the way, is due to a colliery subsidence, and is likely to be more or less permanent. Owing to a check immediately before Nuneaton, our average speed from there to Atherstone was well under 60 m.p.h., but before the Polesworth check we touched 65, and after Tamworth 66, the latter being an unusual figure in view of the Polesworth check. On the slight dip before Rugeley we were doing the still more exceptional speed of 69 m.p.h., and only fell to 64½ at Shugborough Tunnel. But perhaps the finest feat was in attaining and maintaining 60 m.p.h. after Stafford slack, up the 1 in 514 which extends for some 5 miles past Norton Bridge; up the subsequent 2½ miles at 1 in 650 to Standon Bridge the rate increased to 61½ m.p.h., while on the 1 in 398 to Whitmore we fell to 57½ m.p.h. The culminating effort was a momentary maximum of 80 m.p.h. in the descent of Madeley bank—a speed I have never previously recorded at this particular point during 12 years of timing. In fact, the only other "80" I have ever noted South of Crewe was one on the old 8.40 a.m. from Euston to Birmingham, down the north descent from Tring. We were severely checked by brakes a mile before passing Basford Sand Sidings Box. Aggregate net gains on what is now the fastest London and North Western schedule of the day were therefore fully 13½ min. between Tring and Rugby and Nuneaton and Crewe, allowing the modest figure of 1¼ min. for the Polesworth check; even granting that the Willesden-Tring and Rugby-Nuneaton bookings are disproportionately tight, and might not have been observed had there been a clear road and no fog, the engine may be credited with, at the very least, 11 or 12 min. gain on

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schedule—a result for which Driver Buckland deserves every congratulation.

In comparison with this last journey, everything else that I have timed south of Crewe seems more or less tame, although I have had a couple of trips on the 1.15 p.m. down that were of some interest on account of the load hauled. On the first we had a 60-axle train, weighing in all 445 tons, and on the second one of 56 axles, or 415 tons, the engines in both cases being "Claughtons"—Nos. 713 and 2083 respectively. By the widening works at Camden we were delayed on the second journey to Willesden, the first 5·4 miles taking 11 min. and 13 min. 5 sec. on the two 2 min. under schedule. But No. 2083 did some much faster running, as on this occasion we covered the 51 miles from Tring to Rugby stop in 53 min. 25 sec.; sustaining 69 m.p.h. down from Tring, we ran thence to Bletchley in 14 min., fell only to 48 m.p.h. up to Roade, the Bletchley-Roade length taking 13 min. 20 sec., and took 10¼ min. thence to Weedon (maximum 62½ m.p.h.), and 6¼ min. thence to Welton, with a minimum of 50 at Kilsby. The concluding time of 8 min. 35 sec. from Kilsby into Rugby was a very smart one, and made the total time from Euston 99½ min., or 97½ min. net.

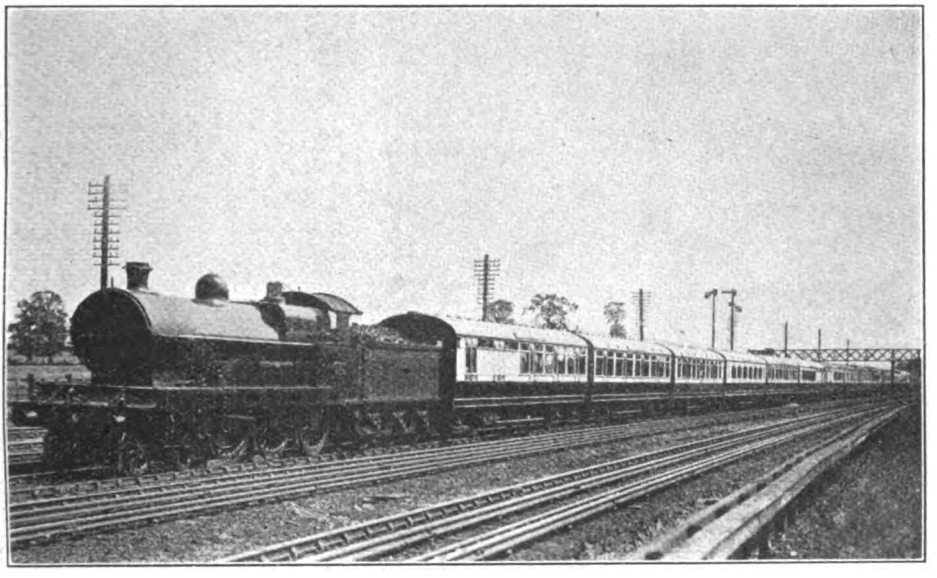

Photo.] LONDON & NORTH WESTERN RAILWAY. [*F. E. Mackay.*

Down Liverpool express passing Kenton. Four-cylinder 4-6-0 locomotive, No. 1131, "Lord Faber."

runs; Watford was passed in 25 min. 5 sec. and 28 min. 55 sec., and Tring in 42 min. 25 sec. and 47 min. 5 sec. (booked 43 min.). Maximum speeds were 55 and 48½ m.p.h. beyond Willesden and 56½ and 50 at Watford, while the minima were 48½ and 43½ m.p.h. at Pinner and 41 (No. 713 was being eased here, owing to being before time) and 46½ at Tring. No. 713 now had no further need for hurry; we took 14 min. 55 sec. from Tring to Bletchley (maximum 67), 14 min. 20 sec. thence to Roade (minimum 41), and 27 min. 20 sec. on to Rugby—a total of 99 min. exactly for the 82·6 miles, or

After Rugby on the first run we were stopped by signals for 2¼ min. at Bulkington, and so took 24 min. 55 sec. to get through Nuneaton, although we had passed Shilton, 8·8 miles, in the excellent time of 12½ min.; on the second we were slacked slightly for p.w. repairs outside Rugby, but passed Nuneaton in 20 min. 25 sec., at 67 m.p.h. To Polesworth the times were 34 min. 35 sec. and 28 min. 50 sec., and to Tamworth, after the usual slight slack beyond Polesworth (prior to which No. 2083 touched 69 m.p.h.) 38 min. 20 sec. and 32¾ min. The last-mentioned, including as it did the Rugby

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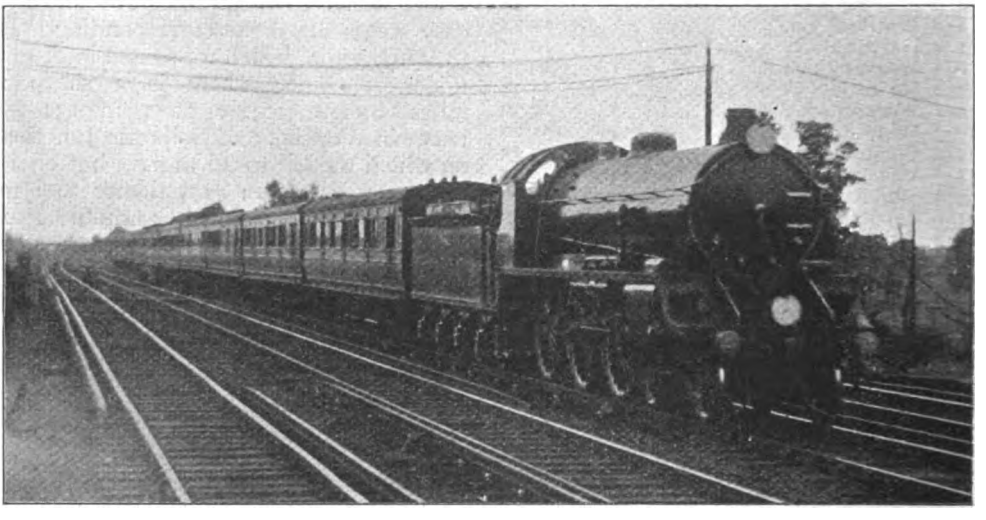
we got up to 60 m.p.h. on the slightly easier than level length to Carnforth, and went up the 2½ subsequent miles at 1 in 134 at a minimum of 45½ m.p.h., rising again to 60 on 3½ miles falling at 1 in 293 and level to near Milnthorpe. The details of Grayrigg and Shap banks have been given so often that they need hardly be recapitulated: suffice it to say that, as regards the former, 3¼ miles mostly at 1 in 173–193 are succeeded by 8¼ almost entirely at 1 in 131–106, 2 miles at the last-mentioned grade forming the concluding pull up to Grayrigg station. Passing Oxenholme at 38·1 m.p.h., we commenced the final 106 at 31·7 and finished it at a steady 27·6 m.p.h. Although we got up to 58½ m.p.h. on the 6 miles' "breathing space" before Shap incline proper, we had dropped ¾-min. on the much harder schedule from Oxenholme to Tebay. Up to Shap Summit the final incline goes at 1 in 147 for 1¾ miles, and then 1 in 75 for 4 miles; on the latter we fell at one point to 18 m.p.h., but the engine was then evidently given another "notch," and we recovered to 20. But from Tebay to Summit 1½ min. were lost, so that we were now only just over 2 min. to the good. Then followed some unaccountably slow running down to Penrith, on which we actually *lost* ¾-min. on the present most leisurely schedule, although we atoned slightly for this by gaining 1¾ min. between Penrith and Carlisle. Even then we never exceeded 67 m.p.h. over this final length, on a road well aligned and obviously laid out for much higher speeds, on which, as I have often pointed out in these columns, the higher speeds for this reason provide appreciably more comfortable travelling.

Consequently we did not gain more than 3 min. from Lancaster to Carlisle when, with nothing more enterprising than even a time of 31 min. for the 31.3 miles from Summit down to Carlisle, we might have gained 7 min. The actual time gained from Crewe to Carlisle was 8 min., but in the ways I have pointed out this might very easily have been increased to 14 min. Nevertheless, with this much heavier than normal load, and nothing more powerful to haul it than a 64-ton "Prince," Driver Prothero achieved some really good work. In this connection I wonder whether readers realise, in comparing present-day with pre-war running, to what an enormous extent *coal* is a factor in the situation? One has only to glance at the contents of the average locomotive tender to notice how much the quality of the fuel has fallen off, as compared with that of pre-war days. Now on a fairly long run of



LONDON & SOUTH WESTERN RAILWAY.

Plymouth to Waterloo express, passing Raynes Park. 4-6-0 engine, No. 742.

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this character the gradual choking of the firegrate with clinker would be just beginning to make itself felt when the hardest work was required of the engine, on the ascent of Shap, so that it would be practically impossible for pre-war speeds to be realised at the summit of the bank. I think these considerations were brought home to me with the most force by the colour of the fireman's face, which on arrival at Carlisle bore eloquent testimony to the dustiness of the fuel handled by that hard-worked functionary!

Two runs in the same direction, on the 1 p.m. from Crewe, had the makings of fine trips, had we not unfortunately been so desperately punctual in starting on both occasions. The trains were both "Claughton"-hauled, by Nos. 2445 and 1345, *James Bishop*, respectively, and were made up to 40 and 44 axles, or 300 and 320 tons full. Both commenced brilliantly with accelerations to 60 m.p.h. in the first 4.9 dead level miles (to Minshull Vernon), and times of exactly 8 min. in each case for this distance; Winsford Junction was passed in 11¾ min. on both runs, Weaver Junction in 18 min. 25 and 35 sec., Moore in 23 min. 35 and 30 sec., and Warrington in 26 min. 50 and 35 sec. Maxima were 71½ and 69 m.p.h. at Hartford, and 65 and 69 at Moore, with minima of 52½ and 51 m.p.h. at the Ship Canal. Both drivers slackened through Warrington, and the pace thereafter was more leisurely, the times to Wigan being 41 min. 5 and 0 sec., Coppull 49 min. 20 sec. and 50 min. 15 sec., Preston 59 min. 20 sec. and 61 min. 5 sec., Garstang 72 min. 40 sec. and 73 min, 40 sec., and Lancaster 84 min. 50 sec. and 85 min. 45 sec. Then came checks, No. 2445 being badly slowed for p.w.r. repairs between Lancaster and Hest Bank, while No. 1345 was brought down to a walking pace on account of disconnected signals at Carnforth No. 3 box, the loss in both cases being about 3 min. Carnforth was passed in 93 min. 40 sec. and 92 min., Milnthorpe in 102 min. 35 sec. and 104¼ min., Oxenholme in 111 min. 20 sec. and 112 min. 10 sec., Grayrigg in 125 min. 50 sec. and 126¼ min., Tebay in 133 min. and 134¼ min. (we went unaccountably slowly from Grayrigg to Tebay on the second run), and Summit in 144½ min. and 146 min. 10 sec. Minimum speeds on Grayrigg bank were 27½ and 25½ m.p.h. (No. 2445 fell only from 30½ to 27½ m.p.h. between Oxenholme and Grayrigg); up Shap No. 2445 dropped to 22, whereas No. 1345,

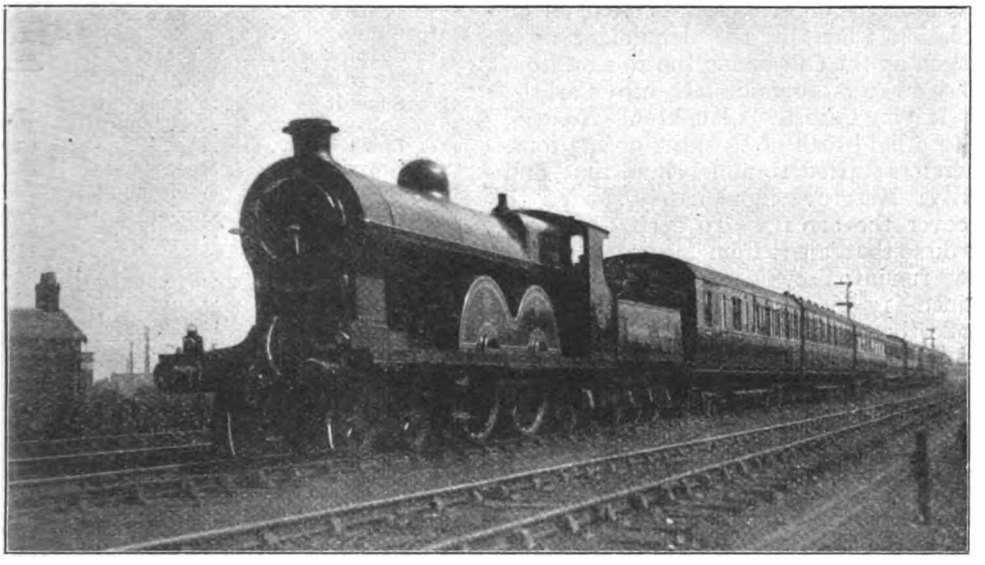

Photo.] LANCASHIRE & YORKSHIRE RAILWAY. [*G. W. Smith.*

3.50 p.m. Manchester-York express. 4-4-2 engine, No. 1400.

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New Pullman Cars, South Eastern and Chatham Railway.

SO popular have the Pullman cars in use on the Continental and other expresses of the South Eastern and Chatham Railway proved, that six further cars have recently been added, constructed by the Birmingham Railway Carriage and Wagon Company, Limited, at their works at Smethwick.

There are three parlour, and three parlour and kitchen cars. The parlour cars are named respectively the *Padua*, *Milan* and *Calais*. Of these the first is panelled in inlaid mahogany in the Sheraton style, and the *Rosalind* (Hepplewhite) in green. The parlour cars have two large compartments, one to seat ten and the others to seat eight passengers with, in addition, two small compartments, each seating four passengers. Lavatory accommodation is provided at one end and a pantry at the other, enclosed vestibule compartments being provided at each end. Access is gained to all compartments by means of hinged doors opening from corridors which extend from the vestibule to the entrance doors of the large compartment.

INTERIOR OF SALOON COMPARTMENT.

the carpets and upholstery being light green. The *Milan* is finished in pear wood to Greek design, with saxe blue carpets and upholstery, whilst the *Calais* is panelled in cherry wood with the Persian style of decoration matched by red carpets and upholstering, "Friezette" cloth being used for the upholstery. The parlour and kitchen cars are all panelled in mahogany. Of these the *Palmyra* is decorated in the Adams style with blue carpets and blue leather upholstery, the *Portia* (Sheraton) being finished in rep

Corner cupboards are fixed in the corridor at each end of the body.

The combined parlour and kitchen cars each have one large compartment to seat 12 passengers and one small compartment to seat four passengers, also a lavatory compartment at one end of the carriage. The remainder of the space is allotted to the kitchen section and pantry, these being equipped in the most complete manner with cooking stove, sinks, cupboards, racks, &c..

As is usual in vehicles of this type the

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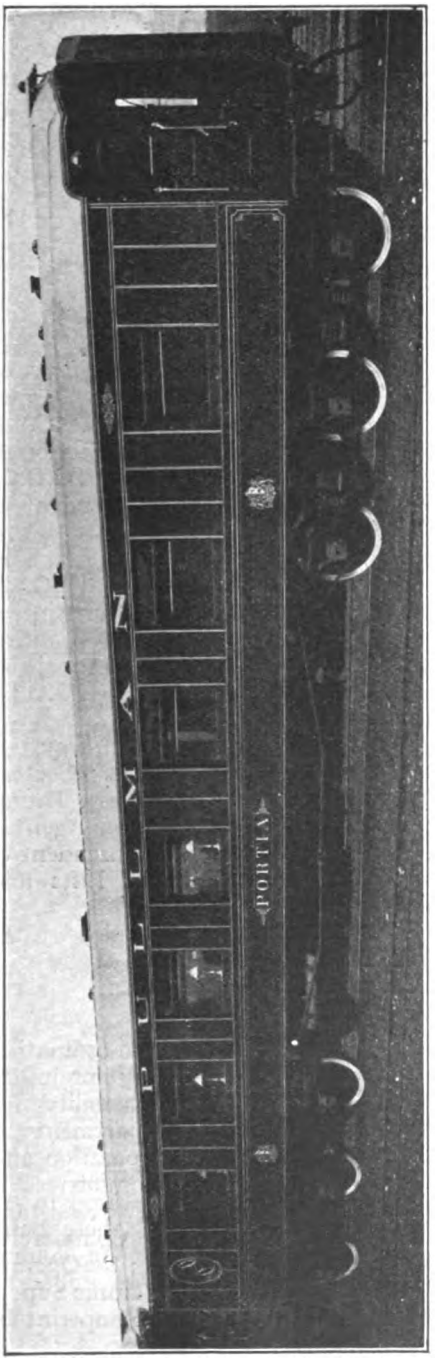
window spacing is liberal. The cars are electrically lighted, the lamps being suitably disposed, and all wires easy of access. A lamp of standard pattern is fitted over each entrance door. The lighting arrangements further include table lamps and fittings of the latest "Pullman" design. Switches are provided at the kitchen and pantry ends of the cars. The heating arrangements are on the steam heating "vapour" system.



PULLMAN PARLOUR AND KITCHEN CAR "PORTIA."

Passenger compartments are equipped with removable tables having glass tops, also small tables for single passengers where required. The tables for three or more passengers are of the extensible type. A clock is fixed in the large compartment of each car. The parcel racks, hat and coat hooks, electric ceiling and wall brackets are finished in mercurial gilt, the remainder of the fittings being in polished brass. The kitchen is fitted with one gas-cooking suite with combustion chamber and plate-warmer, also gas compressor gauge, a large sink with draining board, the necessary cupboards, shelving, &c. Hot and cold water are laid on to the sinks. The gas for cooking purposes is carried in reservoirs below the underframe. Compensating, collapsible gangways are fitted at each end of the car, these having corduroy coverings for the gangways and panellings, of standard make and design. The side vestibule doors are of mahogany, with the top panel of clear bevelled glass, the bevel facing inward. The body entrance doors are also of mahogany with top panels of clear plate glass. They are fitted with special locks of Pullman standard pattern, which must pass the standard master key. The cars are painted on the outside with body colour of lake with gold lettering, the name of the car and the Pullman Company's coat of arms further adding to the excellent style of the exterior finish.

Principal dimensions are as follows :—

Length over buffers (centre) ..	65 ft.
Length over platforms	63 ft. 6 in.
Length over platform headstocks	62 ft.
Length over corner pillars ..	57 ft.
Width over mouldings	8 ft. 6 in.
Width over roof at end (vestibule roof cornice)	7 ft. 8½ in.
Width over cornice mouldings ..	8 ft. 7 in.
Height from rail to top of roof ..	12 ft. 6⅞ in.
Height from floor at centre to underside of ceiling	7 ft. 11⅝ in.
Height from floor to top of cantrail	6 ft. 4 in.
Centre of side buffers from rail ..	3 ft. 5½ in.
Centre of bogies	41 ft.
Wheelbase of bogies	12 ft.
Extreme height from rail over ventilator	13 ft. 0⅞ in.
Diameter of wheel on tread ..	3 ft. 7⅜ in.
Size of journal	8 in. by 4 in.

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The New "Underground" Organisation.

REFERENCE was made last month to the appointment of three of the chief officers of the associated "Underground" companies to the directorate. This was, however, part of a comprehensive reorganisation scheme affecting all the companies concerned, and this is briefly reviewed below, giving also the names of the officers concerned. There are two main companies, with each of which a number of others are associated as follows :—

(*a*) The Underground Electric Railways Company of London, Limited (the Underground Company), with which are associated the Metropolitan District, London Electric, Central London, and City and South London Railway Companies (the railways), and the London General Omnibus Company, Limited, these together constituting the common fund group.

(*b*) The London and Suburban Traction Company, Limited (the Traction Company) together with the Metropolitan Electric Tramways Company, Limited, London United Tramways Company, Limited, and South Metropolitan Electric Tramways and Lighting Company, Limited (the tramways).

Arrangements affecting the respective directorates, various committees, and a Standing Joint Committee (having a separate secretary attached to the chairman's office), with the relations of the various chief officers thereto are set forth in very complete detail. Eight departments are set up, the scope and duties of each being clearly indicated, the names of the officers (a few appointments are left blank, as they have not yet been filled) being also stated, as follows :—

DEPARTMENT A.

Assistant Managing Director in Charge—Frank Pick.

1. *Comptroller and Accountant.*—Officer in charge :—C. S. Louch ; Section A, Statistics—A. W. Green ; Section B, Accounts—D. B. Colyer ; Section C, General Audit—G. Eland ; Section D, Traffic Audit—H. N. Trye.

2. *Commercial Manager.*—Officer in charge—Arthur L. Barber ; Section A, Fares—S. J. Webb ; Section B, Development—C. B. Gilbert ; Section C, Investigation—J. E. Cowderoy.

3. *Publicity Officer.*—Officer in charge— ; Section A, Press : J. H. Richardson ; Section B, Traffic Advertising : H. T. Carr.

4. Legal and Parliamentary Officer—C. G. Page.

5. Purchasing Agent—A Coveney ; Deputy Purchasing Agent—

6. Commercial Advertising Agent—H. L. Spratt.

DEPARTMENT B.

Assistant Managing Director in Charge.—H. E. Blain, C.B.E.

1. *Operating Manager* (*L.G.O.C.*).—Officer in charge—C. J. Shave ; Section A, Superintendent of Rolling-Stock (L.G.O.C.) A. Rozier ; Assistant Superintendent of Rolling-Stock (L.G.O.C.)— ; Section B, Traffic Superintendent—H. S. F. Lansdown ; Road Superintendent—G. P. Barnett ; Section C, Ticket Superintendent—S. Smith ; Section D, Investigation—J. E. Cowderoy. Section D is join between the Operating Manager (L.G.O.C.) and the Commercial Manager.

2. *Operating Manager* (*Railways*).—Officer in charge—J. P. Thomas ; Section A, Superintendent of the Line—J. Thornton ; Section B, Chief Passenger Agent—S. J. Webb ; Section C, Superintendent of Rolling-Stock (Railways) and Lifts and Escalators—

3. Superintendent of Schedules—J. B. Mackinnon.

4. Claims Agent—S. Newman.

5. Staff Officer—A. T. Spens.

For the purpose of securing co-ordination in the discharge of, but without prejudice to their departmental responsibility for the respective duties in Departments A and B in relation to traffic operation and development, a Traffic Committee is constituted as follows :—The two Assistant Managing Directors ; the Commercial Manager ; the Publicity Officer ; the Operating Manager (L.G.O.C.) ; the Traffic Superintendent (L.G.O.C.) ; and the Superintendent of Schedules.

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DEPARTMENT C.

Director of Construction (Railways) in Charge—Z. E. Knapp

1 Superintendent of Power—P. V. McMahon.

2. Technical Officer—E. H. Cockshott.

3. Architectural Officer—S. A. Heaps.

DEPARTMENT D.

Chief Engineer (L.G.O.C.) in Charge—G. J. Shave.

1. Engineer—C. Leese.

2. Research Engineer—

3. Architect and Surveyor—J. E. Ashby.

DEPARTMENT E.

Chief Engineer (Railways) in Charge—A. R. Cooper.

1. Mechanical Engineer—W. A. Agnew.

2. Civil Engineer—

3. Signal Engineer—W. S. Every.

4. Assistant Engineer (Indoor)—C. E. Stanier.

DEPARTMENT F.

General Manager (Tramways) in Charge—C. J. Spencer.

1. Deputy General Manager and Engineer—A. V. Mason; Section A, Traffic Superintendent—
Section B, Mechanical Engineer—H. J. Troughton; Section C, Distribution Engineer—P. M. Hunt; Section D, Permanent Way Engineer—E. Bond.

2. Accountant—J. McLeod.

DEPARTMENT G.

Secretary and Treasurer in Charge—J. C. Mitchell.

1. Assistant Secretary and Treasurer—J. L. B. Lindsay.

2. Assistant Treasurer—H. C. Davy.

3. Estate Agent—F. C. Buller.

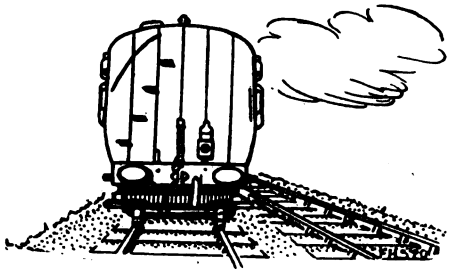
DEPARTMENT H.

Secretary and Treasurer (Tramways) in Charge—E. Boys.

Assistant Secretary and Treasurer—A. C. Ingram.

The following appointments may also be noted: Secretary to the Standing Joint Committee—R. H. Pitts, and Secretary to the Chairman—C. R. Eddison.

In general these appointments represent the specific allocation of duties already carried out by many of the officers whose names and duties are set forth above, except in so far as they are modified by the appointments of Mr. H. E. Blain, Mr. Frank Pick and Mr. Z. E. Knapp to the board, and such other changes as the new organisation has necessitated. There are also numerous appointments of secondary responsibility, and we are pleased to note that in the case of the Publicity Department, Mr. B. C. Foxcroft, who has for some years been in charge of the Press Bureau, and to whose unfailing courtesy and co-operation the RAILWAY MAGAZINE has been indebted on many occasions, is appointed assistant to Mr. J. H. Richardson, Press Agent.



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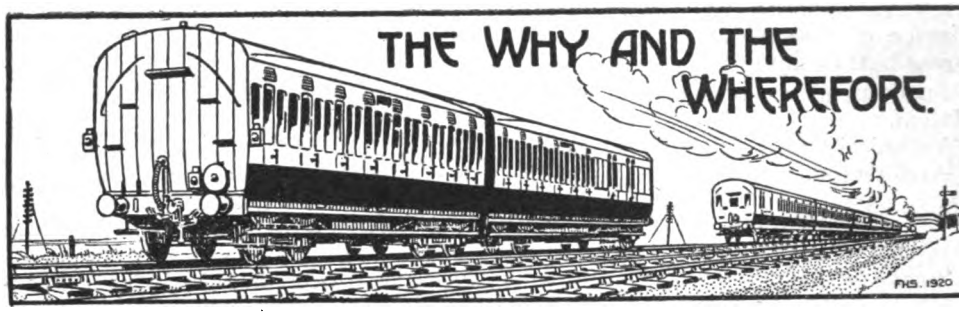

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," the twenty-third Annual Edition, published in April,* 1920, *is out of print, but a new one is in preparation, in readiness for publication in April,* 1921

Principal Locomotive Depots, Great Western Railway.

Engines attached to each bear 3-in. indicating letters inside the cab as follows: PDN, Old Oak Common; RDG, Reading; SHL, Southall; SDN, Swindon; OXF, Oxford; DID, Didcot; BAN, Banbury; GLO, Gloucester; WES, Westbury; BL, Bristol (Bath Road); BL, Bristol (S.P.M.); TN, Taunton; WEY, Weymouth; NA, Newton Abbot; PLY, Plymouth (Mill Bay); PLY, Plymouth (Laira); EXE, Exeter; SBLZ, St. Blazey; TR, Truro; PZ, Penzance; NPT, Newport (Dock Street); NPT, Newport (Ebbw Junction); CDF, Cardiff, PPL, Pontypool Road; ABDR, Aberdare; STJ, Severn Tunnel Junction; NEA, Neath; SED, Swansea; LLY, Llanelly; LDR, Landore; CAR, Carmarthen; WPN, Wolverhampton; BHD, Birkenhead; CHR, Chester; TYS, Tyseley; SALOP, Shrewsbury; WPN, Oxley; STB, Stourbridge; CNYD, Croes Newydd; WOS, Worcester; HFD, Hereford.

[Reply to A. A. Cox, W. T. HODKINSON and others.]

Through Working, London to Central Wales.

One of the allocations of traffic which took place during the war was that the Great Western Company should take all the traffic from London to Shrewsbury and Central Wales generally. As a result of this arrangement the workings between Euston and Central Wales by the London and North Western route have been withdrawn, and the service between Stafford and Shrewsbury, by which the through coaches were conveyed, has been reduced to a purely local one calling at all stations. In order that the Central Wales Spas, which are served only by the Central Wales line of the London and North Western, may have as good a service as heretofore, however, arrangements have been made for the London through coaches to be worked by the Great Western Railway between Paddington and Shrewsbury, and the London and North Western coach that you have noted on the 10.15 a.m. ex-Paddington is so engaged.

[Reply to A. L. B.]

2-10-2 Locomotives.

Commenting upon our reply in the February number, Mr. W. T. Hoecker, of Galveston, Texas, U.S.A., writes in regard to the 2-10-2 tandem compound locomotives of the Atchison, Topeka and Santa Fe Railway: "There were originally 160 engines of classes 900 and 1600 built between 1903 and 1907. Ten of these were used as the rear units of the 3000 class of Mallet engines in 1910. These have since been broken up and rebuilt as simple 2-10-2 engines; 104 additional tandem compounds of class 900 and 1600 have been rebuilt as simple 2-10-2 engines

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with two 28 in. × 32 in. cylinders and fitted with superheaters, leaving less than 50 of the tandem compounds running in their original condition as at September, 1920. The remainder are being converted as they go into the shops for heavy repairs, and it will be but a short time before the tandem compounds cease to exist as such."

[Further reply to "BOGIE."]

Single Line Working.

There are special forms of tablet instruments which allow one train to follow another "permissively" before the first has cleared the section, but these are not generally employed in British practice. With the staff and ticket system, however, a train can follow another in this way, but as a rule the first must have cleared the section before the second is allowed to start. There are instances, however, where intermediate tablet instruments are installed (sometimes even where trains cannot be "crossed"), and there are several conditions under which one train may follow another under perfectly safe conditions, after a short interval. Indeed, if the tablet section, which may not be the same as the station to station section, is fairly short, 10 minutes is a quite practicable interval, though we are not aware of the exact circumstances of the location you name. [Reply to R. D. JAMES.]

Private Sidings.

Work in connection with the installation of private sidings is in two parts; the actual connection with the railway and the portion of the siding within the railway boundary, and also the portion outside the railway boundary. The former is always carried out by the railway and generally charged to capital account; if the value of the traffic forwarded over the railway from the private siding exceeds 10 per cent. of the cost, it is not customary to charge a rental for the use of this portion, otherwise a proportionate rental is charged. As regards the portion of the siding outside the railway boundary, this is sometimes carried out by the railway at the private owner's expense, but if carried out by the latter it must be constructed to the railway company's approval if the engines of the latter are to be allowed to work over it.

[Reply to R. W. A. SALTER.]

Uniform Signalling.

In large measure the signalling of all leading railways is already uniform, but there are detail differences, and especially in regard to secondary and shunting signals. As a rule, however, the latter require local knowledge and a driver from another section of the owning railway may lack this as much as one from another system. "Foreign" drivers must be qualified to take trains over lines such as those you mention, or else the services of a pilotman are called in. For these and other reasons detail diversity in practice is not so serious as it might appear. Power signalling is entirely a matter of expense. You must also remember that its installation displaces material which has very considerable value in itself.

[Reply to E. L. ORMEROD.]

Longest Locomotive Runs.

Presumably you mean continuous and not non-stop runs. If the former the longest on the Great Western Railway is London–Plymouth, 225¾ miles; on the Midland London–Leeds, 203½ miles by the longest route (*via* Nottingham and Sheffield); on the London and North Western Railway, London–Liverpool, 193¾ miles; on the Great Northern Railway, York-Peterborough, 112¾ miles, and on the Great Eastern Railway London–Cromer, 138 miles (summer only). Engine crews are frequently changed on these journeys, owing to the system of double-manning now in force.

[Reply to C. S. ORPEN.]

4-2-2-0 Engines, London and South Western Railway.

Reference to these engines was perfectly correct; they were the first 4-cylinder engines designed by the late Mr. D. Drummond, and corresponded generally to his 4-4-0 engines except that the driving wheels were uncoupled, the leading pair being driven by the inside, and the trailing by the outside cylinders. The wheel notation in this case is thus four carrying wheels at the leading end of the engine, two independent pairs of single driving wheels, and 0 carrying wheels under the cab, or 4-2-2-0. We are obliged for the other information in your letter.

[Reply to G. WINDSOR.]

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Special Wagons, Midland Railway.

For capacities exceeding 15 tons the following wagons are in use: Locomotive coal, 20 and 30 tons; armour plate, 40 and 50 tons; bogie rail, 30 and 35 tons; boiler, 18, 25, 30, 40 and 60 tons; flat, 20 tons; gun, 60 and 100 tons; hollow bolster, 18 tons; hot armour plate, 25 and 40 tons; implement, 18 tons; wheel, 18 tons. Some of these wagons are designed to meet the needs of particular trades and districts, and in the case of large gun trucks are used under special conditions.

[Reply to G. H.]

A Locomotive Difficulty.

While an engine is running at a constant speed, without slipping, the crank revolves in a circular path at what is also a constant speed with regard to the engine itself. In relation to the track the crank describes a cycloidal path, but this is difficult to describe exactly without the aid of a diagram. To answer your query more definitely, "regular" is certainly a more correct adjective to apply to the path of the crank than "irregular," although the former does not fully explain the nature of the motion.

[Reply to C. GRINDLE.]

Locomotives of Great Northern Railway (Ireland).

We know of no reason to prevent the use of 4-6-0 or 4-4-2 express engines on this railway, other than the fact that the existing superheated 4-4-0 engines of the "Carrantuohill" class are of ample power to meet all the present traffic demands. These engines do not work over the lines west of Dundalk and Portadown; the principal Londonderry expresses are worked by a class of superheated 4-4-0 locomotive with smaller boilers and driving wheels.

[Reply to HENRY FORDE.]

Bishops Castle Railway.

This line was fully described in an early number of the RAILWAY MAGAZINE. It was opened in 1866, is 9¾ miles long, possesses two locomotives, six passenger vehicles and 19 goods vehicles. It is at present in Chancery, and is operated under a receiver and manager. Presumably under the grouping scheme it will pass into the hands of the Great Western Railway, and possibly the extension you suggest to join up with the Cambrian system may one day be undertaken.

[Reply to R. LANGSLOW.]

1.20 p.m. King's Cross to Edinburgh.

This train calls at Clifton Junction (¼-mile north of York) at 5.25–5.30 p.m. for the purpose of changing engines only. The 5.30 p.m. down Newcastle and the corresponding up train at 8 a.m. did the same until the beginning of November, 1920, when the practice was discontinued. During the summer the 9.50 a.m. down relief "Scotsman," and one of the up night trains were similarly arranged. At present the 1.20 p.m. is the only express "missing" York for passenger purposes.

[Reply to "NON-STOP."]

Inter-locking Signals with Tablet or Electric Train Staff Instruments.

Proposals of this class have been considered for many years, and there are a few places where something in this direction is done. A difficulty is that shunting movements within station limits are hampered by interlocking affecting the points and the starting signals. Exchanging devices, whether for tablet or staff, are only of value to avoid the necessity for stopping or slowing down; they have no safety value in themselves.

[Reply to A. C. EDWARD.]

Locomotive Depots, Lancashire and Yorkshire Railway.

The principal depôts are: 1, Newton Heath; 2, Low Moor; 5, Mirfield; 6, Wakefield; 10, Goole; 13, Agecroft; 14, Bolton; 16, Wigan; 18, Bank Hall; 19, Aintree; 20, Bury; 21, Bacup; 22, Accrington; 25, Lower Darwen; 27, Lostock Hall; 30, Fleetwood; 32, Blackpool (Central). Numbers omitted relate to smaller depôts or are blank. A small number plate is attached to the centre of the engine cab.

[Reply to R. S. H.]

Setting Back.

This usually occurs when the engine has stopped in such a position that steam cannot enter one cylinder, or that the power cannot be suitably applied. The driver therefore reverses so as to change the positions of the valves, and thus enable him to get a start. This occurs

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on all railways at times, and obviously is most evident with heavy loads or where the gradient is adverse.

[Reply to G. H.]

Railway Rule Books.

The railway "Book of Rules and Regulations" is supplied to, and its receipt must be signed for by, every member of the railway staff. Your other question is incomprehensible. Why not purchase a copy of the South Eastern and Chatham Railway time-tables, the map contained therein will help you to elucidate these knotty points?

[Reply to A. C. H.]

A "Claughton" Query.

In the earlier engines of this class the superheater dampers were operated by an arrangement carried along the engine hand-rail and terminating exteriorly in a bell-crank at the smoke-box end of the hand-rail; this has in subsequent engines been superseded by an arrangement worked in direct connection with the regulator.

[Reply to "RUGBEIAN"]

Highland Engine Chimneys.

The majority of the locomotives designed by the late Mr. C. Jones for this railway had chimneys of which the fronts were arranged in the form of a "louvre," with the object of improving the draught. A number of these engines are still at work so fitted. Your second question is not sufficiently explicit to be capable of answer.

[Reply to D. J. BELL.]

Electric Train Working.

Whether lights are extinguished as electric trains pass over points, due to the interruption of contact of the collecting shoes with the current rails, depends upon the particular equipment of the vehicles and trains. Sometimes if one shoe cannot take current another can, and in other instances reserve lighting from batteries comes into play for the moment.

[Reply to "REJAX."]

North British Railway Locomotive Exchange.

We know of no exchange between the North British and Midland Railways such as that to which you refer. Probably you are thinking of the loan by the Great Western Railway of one of their large 2-8-0 mineral locomotives for experimental running on the North British Railway between Dunfermline and Perth.

[Reply to W. E. BOYD AND R. F.]

Signals Permanently "Off."

Where a signal cabin is "switched out" its signals are placed in the clear position and cease to count for the time being. Usually this occurs on Sundays, but in a few instances cabins closed during the war have not been brought into use again, or they are only opened to meet circumstances of special traffic pressure.

[Reply to "REJAX."]

Maximum Number of Coaches on Trains.

No definite figure can be stated. The maximum allowance of coaches varies according to the practice of the railway, the timing of the train, the load, the type of locomotive, the grading of the route concerned, and the availability or otherwise of pilot assistance.

[Reply to O. G. MYTTON DAVIES.]

Lancashire and Yorkshire Railway Express Locomotives.

We believe that it is intended to rebuild all the 4-4-2 and 4-6-0 express engines on this railway with superheaters, and doubtless No. 1514, the altered appearance of which you noted recently, is one of the first of the latter type to be so dealt with.

[Reply to ROBERT F. LEGGET.]

Changing Engines.

There is nothing worthy of note in the fact that engines were changed at Bedford on the 11.50 a.m. express from London to Manchester on a recent Sunday. It was doubtless a matter of convenience in locomotive working on that day.

[Relpy to O. G. MYTTON DAVIES.]

East Coast Locomotive Working.

All East Coast passenger trains between Newcastle and Edinburgh are, by special arrangement with the North British Railway, worked through to Edinburgh by North Eastern locomotives, whether the trains stop at Berwick or no.

[Reply to N. B. R.]

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Oval Buffers.

Buffers on long coaching vehicles are made oval in shape in order to obviate the possibility of interlocking of buffers on sharp curves. Latest types of locomotive on the Great Central Railway are similarly equipped.

[Reply to C. R. HODGSON.]

Twelve-wheeled Passenger Brake-vans.

Vehicles of this type on the Great Northern Railway of Ireland are not unique. The Great Western Railway has some 12-wheeled vans, 75 ft. long, for the conveyance of Transatlantic mail traffic, lettered "Ocean Mails."

[Reply to J. MACARTNEY ROBBINS.]

2-6-2 Type Tank Engines, Great Western Railway.

The engine you noted on Bruton bank was one of a small number of this wheel arrangement on the Great Western Railway which have inside cylinders; they were rebuilt in this form from 0-6-0 tender goods locomotives.

[Reply to "STAR."]

Slip Coaches, South Eastern and Chatham Railway.

Carriages are slipped daily on this railway at Ashford, Faversham and Swanley Junction. They were at one time slipped also at Paddock Wood, Shorncliffe and Herne Hill, but these slips were discontinued during the war.

[Reply to R. STRINGER.]

Pullman Cars, South Eastern and Chatham Railway.

These are named as follows: Parlour cars—*Padua*, *Milan* and *Calais*; parlour and kitchen cars—*Portia*, *Palmyra* and *Rosalind*. These are the property of the Pullman Car Company.

[Reply to F. N. LANCE and R. STRINGER.]

Electric Trains, London, Brighton and South Coast Railway.

These trains can be, and occasionally are, though usually to and from the car sheds only, run to Selhurst *via* the main line, through Norbury, but, as already explained, this is not a regular working as yet.

[Reply to F. N LANCE.]

12-Wheeled Vehicles, Great Western Railway.

All ordinary vehicles on this line are now eight-wheeled, though there are some 12-wheeled dining cars and special vehicles.

[Reply to A. ROUND.]

0-8-2 Tank Engines, Great Northern Railway.

We cannot say whether the engines of this class now acting as shunters in London will remain on these duties.

[Reply to "AYOT."]

"521" Class 0-6-0 Engines, Great Northern Railway.

This class runs from 521 to 610 and 621 to 630 inclusive; 611 to 620 (except 614) are 0-6-0 saddle tanks.

[Reply to A. CURSLEY.]

4-6-4 Tank Engines, Midland Railway.

These locomotives weigh 90 tons in working order, and have a capacity for 2,200 gallons of water and 3 tons of coal.

[Reply to A. GROUND.]

North British Railway Locomotives.

We understand that some 4-4-2 engines of the standard type—as rebuilt with superheaters—are on order for this line.

[Reply to N. M. R. WILSON.]

Old Engines, Great Northern Railway.

We would refer you to G. F. Bird's "Locomotives of the Great Northern Railway."

[Reply to R. T. NINNIS.]

London and North Western and Great Western Joint Line.

This is double line throughout from Shrewsbury to Hereford.

[Reply to A. P. MIALL.]

Stirling's 8 ft. Singles, Great Northern Railway.

None of these famous locomotives now remains at work.

[Reply to RALPH HUNT.]

4-4-0 No. 437, Great Central Railway.

This engine has been re-named *Prince George*.

[Reply to C. R. HODGSON.]

Wellingborough Accident, 1898.

Engine involved in this derailment was 4-4-0 No. 1743 (old numbering).

[Reply to "DERBY RED."]

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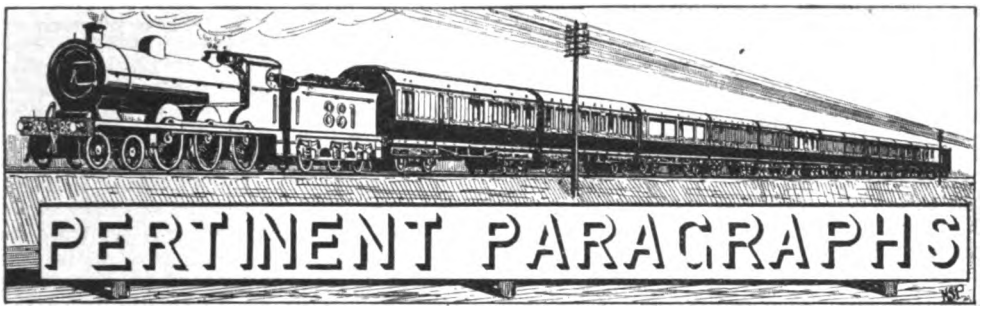

The Railway Meetings.

At most of the railway companies' annual meetings' reference has been made to the relatively heavy increases in expenses due to wages and salaries, the general argument being that these have been raised to an uneconomic level, with the suggestion that in order that the railways shall be able to pay their way when restored to non-guarantee conditions, many of the rates of pay may have to be reduced, apart from the reduction in "cost-of-living" allowances which will follow if present tendencies are continued. Strong comment was also made in regard to the anomalies created by the standardised rates of pay. As Viscount Churchill stated at the Great Western Railway meeting: "As things stand to-day the enormous increases in the wages bill brought about by the Government in standardising rates of pay, and in establishing the eight-hour day, do not provide the adequate margin of profit between receipts and expenses. There is a limit, of course, to which rates and charges can be raised so as to increase revenue, and if this limit be overstepped there is at once the danger of traffic being lost to the railway, either by the inability of the traffic to bear the charges or through other means of transport being resorted to, with the result that the revenue, instead of showing the hoped for increase, is, as a matter of fact, diminished."

At the London and North Western Railway meeting, Sir Gilbert Claughton spoke in similar strain: "Our wages bill in 1913 was six million pounds, and in 1920 it had reached the enormous figure of twenty millions. The various grades have been standardised; that is to say, all men doing the same kind of work receive practically the same rates of pay, whether they are employed at the busiest centres or at the smallest and most remote stations where the trains are few and the duties consequently light: and lads on reaching age 18 are paid adults' wages, amounting, in many cases, to between £3 and £4 per week. There can be no question that with the present high wages and reduced hours no possible economies that can be effected by any system of grouping of the railways, or by any other means that we can see, will, without a further considerable increase in rates and fares, restore the pre-war net revenue earning capacity of the railways, and it must be remembered that increases of rates and fares cannot be carried too far without defeating their object by destroying the traffic, and consequently being a serious menace to the commercial prosperity of the country."

Condemnatory comment upon the Colwyn report was also made by many of the Chairmen and other speakers, while the grouping proposals received considerable attention, with never a good word, however, for the scheme set forward last year by the Ministry of Transport. Another point brought out at several meetings was that the numbers of shareholders—the capitalists who constitute the *bête noir* of irresponsible labour—outnumber the employees, and that the average holdings are correspondingly quite moderate.

Railway Returns, 1919.

Discontinued since 1913, the Ministry of Transport has resumed, as successor to the Railway Department of the Board of Trade, the publication of Annual Returns and Statistics concerning the railways of the United Kingdom, those for the year 1919 now being available. It will be recalled that the returns for the year 1913 were the only ones issued on the basis of information compiled in accordance with the Railway Companies (Accounts and Returns) Act, 1911; and owing to the conditions of Government control and guarantee the returns for 1919 are not so complete, and cannot be compared directly with those for 1913. They are, however, relatively complete, and as throughout the war period only very brief particulars concerning the home railways have been issued, the new data now available includes much of value to those who take more than a superficial interest in railways and traffic working.

First as to the value of the railways of the United Kingdom. Capital authorised is

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£1,415,000,000, of which £1,363,000,000 has been created. Without nominal additions, the capital value is £1,126,000,000, or with additions £1,327,000,000. Reduced to the basis of capital expenditure the value is £1,203,000,000. These figures produced dividends which average only between 3·08 and 4·45 per cent. Notwithstanding that so many railways are largely concerned in other than direct railway work—docks, steamers, road vehicles, hotels, &c.—it is interesting to note that of the total of £1,203,000,000, no less than £1,056,300,000 is directly allocated to the railways themselves. Gross earnings (adjusted as required owing to the conditions of the Government guarantee) can be divided thus :—

	£
Railway	185,377,000
Passenger Road Vehicles ..	105,000
Steamboats	2,828,000
Canals	328,000
Docks, Harbours, and Wharves	4,933,000
Hotels, Refreshment Rooms and Cars ..	6,225,000
Other separate businesses	83,000
Total ..	199,879,000

Against this, expenditure amounted to £187,058,000, and after allowing for other receipts, and net Government compensation to the extent of £35,736,000, the total net income was £53,070,000. It is pointed out that these figures do not include deferred liabilities of the Government in respect of the year 1919, while it must be remembered that whereas expenditure had more than doubled since 1913, freight rates were at pre-war level throughout 1919, and ordinary passenger fares had been increased by 50 per cent. only.

Traffic Statistics.

At the end of 1919 there were 23,046 route miles of standard-gauge (British or Irish) railways, and 678 miles of other gauges, total 23,724 miles. Steam locomotives numbered 24,980, and electric 890. Coaching vehicles for steam trains totalled 51,660; while electric traction involved 1,310 motor cars and 1,684 other vehicles. Rail motor cars numbered 168. Merchandise and mineral vehicles totalled 753,368, while 23,018 waggons were on hire to railways, and service vehicles numbered 50,566. At that time 58 locomotives, 41 coaching vehicles and 17,277 wagons were still overseas.

During the year, passenger train mileage was 203,504,467, freight train mileage 145,364,539, shunting mileage 127,764,727, and the total 532,821,450. Of this 501,693,465 miles were credited to steam locomotives, 30,080,069 to electric traction and 1,047,916 to rail motor cars. These totals, except for electric traction and rail motor cars, are all appreciably less than in 1913, but even with the pre-war freight rates and only the 50 per cent. increase on ordinary passenger fares, the average receipts per train mile had increased, as compared with 1913, from 50·03d. to 127·81d. for passenger train traffic, and from 98·61d. to 123·81d. for freight traffic, while the average receipts per route mile had risen from £2,406 to £4,570 (passenger) and £2,811 to £3,161 (freight).

Passenger traffic gave the following interesting comparisons :—

	1919.	1913.
Ordinary—		
First Class ..	47,647,654	26,532,930
Second Class..	7,005,160	12,907,030
Third Class ..	1,083,458,754	933,249,252
Total ..	1,135,111,568	972,689,212
Workmen ..	416,607,548	256,722,922
Season Tickets..	923,368	596,566

Including estimated journeys and season-ticket holders, no fewer than 2,105,739,916 journeys were made during 1919, an increase of 32 per cent. on 1913. The tonnage of freight traffic had, however, appreciably decreased as shown thus :—

	1919.	1913.
General merchandise ..	72,545,774	71,392,169
Coal, Coke and Patent Fuel ..	181,461,627	226,908,645
Other Minerals	56,881,363	71,719,304
Total ..	310,888,764	370,020,118

A Little Learning . . . !

Several readers have directed attention to an article recently published in *Tit-Bits* under the heading "Brains of the Trains," with the sub-title: "What it means to be a Railway Signalman." In some respects the author is fairly correct, except that he seems to have the idea that large cabins are systematically operated by power, whereas even yet there are relatively few thus equipped. But in describing the signalling procedure at an ordinary cabin, the writer is somewhat confusing, seeing that he speaks of an express "already offered" going "thundering by," after which it is offered to the next signalman, which offer is "rejected" and "immediately you depress a lever and the express comes to a standstill half-a-mile away." As far as one can gather the writer is attempting to describe the procedure of up and down trains simultaneously "offered," &c.,

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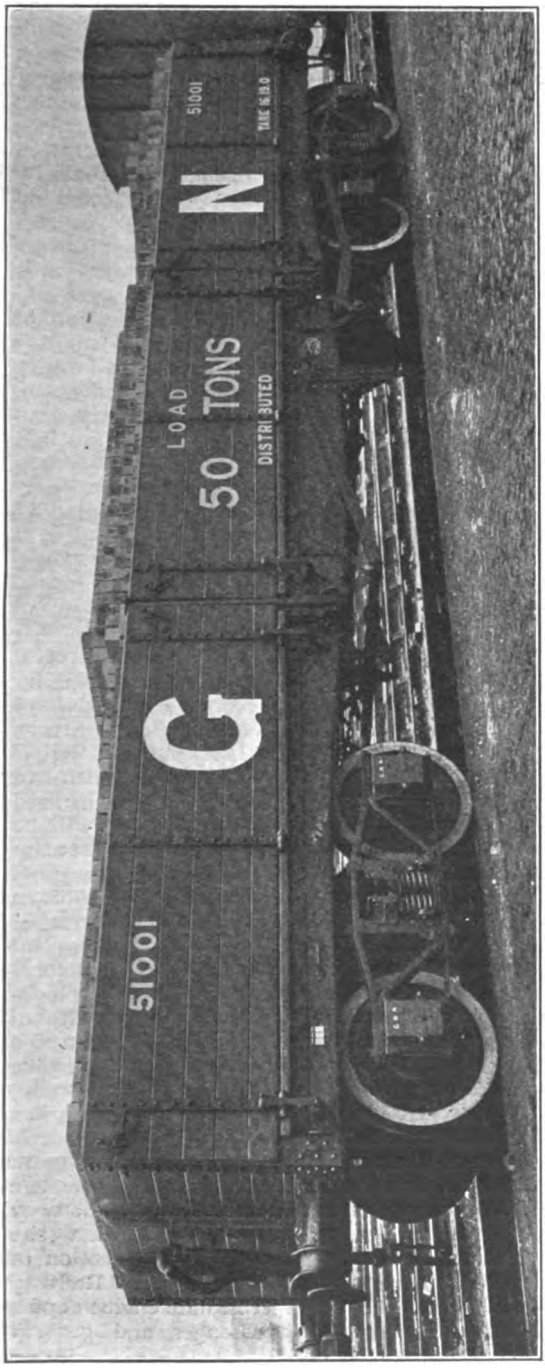
with consequent confusion; but even if the various stages of the procedure are correctly sorted out, it may be questioned whether general readers will be much the wiser. Reference is also made to the tablet system, but this is passably correct, though not as clear as it might be.



50-TON BOGIE WAGON FOR BRICK TRAFFIC, GREAT NORTHERN RAILWAY.

50-ton Open Wagons, Great Northern Railway.

By the courtesy of Mr. H. N. Gresley, C.B.E., Locomotive Engineer of the Great Northern Railway, we are enabled to illustrate and describe a new high-sided bogie open wagon of 50 tons carrying capacity, of which an order for 25 is being executed by the Leeds Forge Company, Limited, for service on that railway. Although primarily intended for the conveyance of bricks between Peterborough and London, the vehicles are equally suitable for road metal, ironstone, slag and other heavy traffic. The wagons are equipped with vacuum and hand brakes, and their empty weight is 16 tons 19 cwt., which is remarkably low for vehicles of this size and capacity, the ratio of gross weight (66 tons 19 cwt.) to paying load (50 tons) being 75 per cent. compared with about 60 per cent. for existing 10-ton and 12-ton four-wheeled wagons fitted with hand brakes only. The illustration shows one of the wagons loaded by the London Brick Company, Limited, with 20,000 "Phorprés" Fletton bricks.

We understand that as the immediate outcome of the speed and ease with which loading can be done a very considerable reduction in handling and other charges is likely to be effected.

The wagons are provided with side doors divided into three sections, extending the full length of the vehicle, "Monarch" door controllers being fitted to facilitate the closing of the doors. Pressed steel stanchions are provided on each side of the centre door, which can be lifted out when necessary. Hand brakes are fitted on both sides of the wagon 1 to each bogie. The vacuum brake is also fitted, two 15-in. vacuum cylinders being provided. The underframe of the wagon is built entirely of pressed steel, and is carried on diamond frame bogies fitted with oil axle-boxes and pressed steel Schoen wheels mounted on axles having journals 10 in. by 5½-in. diam.

The floor of the wagon is of wood, as are the sides and ends. These are the first 50-ton ordinary open goods wagons to be used on any British railway.

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Pullman Cars on the Great Eastern Railway.

In addition to the five first-class Pullman cars which are already in service on the Great Eastern Railway, one second-class car and two third-class cars have been delivered from the builders, Clayton Wagons, Limited, Lincoln. There are thus Pullman cars for three classes, and although the second-class cars are due to the fact that they are now included in the make-up of the Continental trains, which are first and second class, this fact is one of interest in view of the growing tendency to provide special accommodation for other than first-class passengers on several lines. The new cars are of the same dimensions and outside colourings as the first-class cars, but instead of moveable chairs being provided the seats are fixed but of tip-up design. Each car (first, second and third), is self-contained and provided with kitchen and pantry. The cars are panelled in mahogany with inlays. The second-class car is upholstered in dark red friezette, whilst the third-class cars are upholstered in green leather. The floors are covered with green linoleum, with green carpet down the centre.

On and from Monday, February 28, Pullman cars were placed in the undermentioned trains :—

Down, weekdays: 2.34 p.m., Liverpool Street to Hunstanton (first-class); 3.10 p.m., Liverpool Street to Yarmouth (South Town) (first and third-class); 6.39 p.m., Liverpool Street to Walton-on-the-Naze (first and third-class); 8.30 p.m., Liverpool Street to Parkeston, Hook of Holland boat express (first and second-class); 8.40 p.m., Liverpool Street to Parkeston, Antwerp boat express (first-class).

Up, weekdays: 6.32 a.m., Parkeston to Liverpool Street, Antwerp boat express, not Mondays (first-class); 8.55 a.m., Parkeston to Liverpool Street, Hook of Holland boat express, not Mondays (first and second-class); 7.35 a.m., Walton-on-the-Naze to Liverpool Street (first and third-class); 7.50 a.m., Hunstanton to Liverpool Street (first-class); 2.24 p.m., Yarmouth (South Town) to Liverpool Street (first and third-class).

Sundays: 6.32 a.m., Parkeston to Liverpool Street, Antwerp boat express (first-class); 8.55 a.m., Parkeston to Liverpool Street, Hook of Holland boat express (first and second-class).

Traffic Aspects of Main Line Railway Electrification.

Addressing the members of the Institute of Transport, Sir Philip Nash, Director-General of Traffic, Ministry of Transport, pointed out that the electrification of main lines can only be expected to show direct savings when traffic is very dense, and even in such cases the most favourable conditions for electrification are a net-work of lines covering a rather limited radius, or a section of line where the volume of traffic is such that increased line capacity must be provided if steam haulage is to be continued as the system. From a traffic working point of view the principal fields for electrification appear to be:—(1) Short-haul passenger services. (2) For the operation of terminals of large cities, especially those having tunnels. Electrification as a method of operation increases the capacity of such terminals by eliminating idle locomotive and coaching movements. (3) Freight haulage over sections of line having very dense traffic or heavy gradients. (4) In cerain large yards for freight shunting services.

An important aspect is the question of system to be adopted. In this country a start has been made to ensure uniformity in certain essential features of electrification. It is clear that unless, in these early days of electrification, some regulations are laid down, we shall, years hence, find ourselves in the same position in regard to interchangeability of electrical railway equipment that we are in to-day in the absence of uniformity in air brakes, loading gauge, wagon stock and other matters.

Special factors in Electric Operation.

Sir Philip also referred to various special factors, such as the limitations imposed by the inability of the electric locomotive to vary speed and tractive effort as readily as the steam locomotive; and the fact that if the superior speed and hauling abilities of the electric locomotive are to be fully utilised for goods traffic, continuous brakes will be essential. Moreover, as compared with steam practice, the savings are not exactly those of the difference in cost of operation as between steam and electricity, but rather the effect this will have on the capital expenditure of the undertaking as a whole.

The elimination of train stops for locomotive purposes, inseparable from steam traction, is a valuable advantage. On the Newport-Shildon branch of the North Eastern Railway, which is entirely mineral traffic, 7 per cent. of the total freight engine hours is absorbed in locomotive duties for electric locomotives as against 25 per cent. for steam locomotives on similar services. The electric locomotive is capable of performing a very much higher mileage per day than the steam locomotive, and a 440-mile section of the Chicago, Milwaukee and St. Paul Railway is worked with one intermediate engine depôt, and both express passenger and general services are worked.

The paper concluded with the following

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summary: The fundamental question is whether the substitution of electric for steam haulage for the purpose of traffic working is warranted by increased efficiency, or by increased production of movement, and, finally, whether it is financially practicable, bearing in mind that electric installations involve higher cost than steam, and there must be a scrapping of existing plants. On the other hand, all the first costs of electrification need not necessarily be charged to capital as, for instance, the cost of electric locomotive or rolling-stock can properly be charged to revenue under the ordinary process of "renewals," as obsolete steam plant requires replacement. There remain the indirect savings or benefits which would be derived from electrification, and these may include the avoidance of doublings or quadruplings of permanent way. They also include the moving of a greater amount of traffic, and, particularly in the case of suburban electrification, new business. The doom of the steam locomotive has not been sounded, and it is a long way off. These facts should not, however, discourage any advocate of electrification, as gradually, where justified, electrification will slowly but surely take place, and there is a large and profitable field for both electrical engineers and manufacturers.

The Discussion.

In several respects this was of even greater value than the paper itself, and brought out many interesting points. Sir John Aspinall, late General Manager of the Lancashire and Yorkshire Railway, stated that he would like to see some of the big shunting yards round London electrified. He also suggested that in this country there were no lines more suitable for electrification than those in South Wales. There the loaded haul was from the collieries down to the sea, and the empty haul upwards, and not only were these lines eminently suitable for electrification in the ordinary way, but they were very suitable for regenerative braking.

Sir William Forbes, General Manager, London, Brighton and South Coast Railway, said that many years ago his company ventured on electrification, and they were quite satisfied with the results. They had recently been investigating the question of electrifying the main line between London and Brighton. He was satisfied that on the capital required for this scheme they would be able to get satisfactory operating economies.

Sir Philip Dawson said that, under suitable conditions, as on the Brighton main line, even at to-day's very high capital expenditure, there would be excellent financial results. As Sir William Forbes had pointed out, after investigation and after comparison between past and present operating costs, there would be a saving in operating expenses of 6 to 7 per cent. Another point was, that unless some railways, such as the Brighton, did something to increase their carrying capacity, they would be unable to cope with the traffic presenting itself. Under complete electrification the terminal accommodation at Victoria and London Bridge stations would be increased 200 per cent. If a railway were suitable for electrification, the advantages outweighed the disadvantages.

Sir Vincent Raven, Chief Mechanical Engineer, North Eastern Railway, mentioned that the electrification of the North Eastern lines round Newcastle had been entirely satisfactory, while the Shildon-Newport electrification had been so successful that five electric locomotives were doing the work performed by thirteen steam locomotives. As to cost of maintenance, Sir Vincent stated that the electric locomotive was at least one-third less than the steam locomotive.

Mr. H. N. Gresley, C.B.E., Locomotive Engineer, Great Northern Railway, referred to the cost per ton-mile of electrified and steam locomotive working, and observed that there did not seem to be much to choose between the best electric practice and steam locomotive haulage on English railways. On the Great Northern line, large superheater coal engines were taking 1,200 tons behind the tender between Peterborough and London, a distance of 80 miles, and he had recently had some tests taken over a period of four weeks as to the coal consumption. This worked out at 103 lb. of coal per 1,000 ton-miles, which was almost identical with that set forth as obtainable under electric haulage conditions. In addition, the latter was based on power-house production figures and not on actual power output on the locomotive.

Sir Philip Dawson on Railway Electrification.

A few days previously, Sir Philip Dawson, the well-known consulting electrical engineer to the London, Brighton and South Coast Railway, had given to the Faraday House Electrical Engineering College an inspiring address on railway electrification, reference to which may fittingly follow the remarks above. He pointed out that while extensive electrical schemes had been carried through, development was still in a more or less experimental stage and it was a good thing Great Britain had not shut the door to developments which might enable them to get better results. With the single exception

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of the Brighton line, which, owing to its forthcoming extension of electrified working to the coast, is to be permitted to continue with its existing system, all British railways are to use the direct current system with a standard pressure at sub-station busbars of 1,500 bolts. In France, on the contrary, the engineers, after studying conditions in Europe and America, have suggested the standardisation of one system, apparently without regard to the possibilities of any other system. Germany, Sweden and Switzerland are standardising on the single phase, with a line pressure of 16,000 volts. Belgium, however, has not yet standardised; the density of traffic is so great and the distances between stations are so small that the probability is that the 1,500 volt c.c. system will be more satisfactory for them. Engineers from Holland have investigated electrification in America but have not yet published their report. In the United States no standardisation has yet been achieved, and both systems are being extended. In this regard, Sir Philip read an abstract from a letter he had received from a famous American electrical engineer, who said "No one seems to attach sufficient importance to the future trend of developments, and the possibilities of both A.C. and D.C. traction. It is deplorable that a check on the development of both systems should be imposed by premature adoption as a standard of either."

Where there is a frequently continuous traffic, d.c. would have the advantage over a.c. Where there are heavy trains and an infrequent service, however, it is very likely that high tension a.c. would cost less than d.c. system—so far as capital is concerned. The whole question comes down to one of finance, and nothing else. and all aspiring engineers should remember that it was not a question of giving a good engineering job and realising efficiency as such, but, primarily, a question of financial return.

Sir Philip here briefly described the utility of multiple-unit trains and the applicability of such trains, and then explained the different classifications of electric locomotives and defined the various methods by which power was transmitted to the driving wheels. He then dealt with more technical questions involved in the transmission of power, and the question of ensuring safety.

Strengthening Cannon Street Railway Bridge.

At a recent meeting of the Institution of Civil Engineers, Mr. George Ellson, O.B.E., M.Inst.C.E., read a valuable paper on this subject. The work became necessary owing to the increased weight of locomotives, and in the course of his paper, Mr. Ellson made a comparison between the live loads at the period of construction and those which had to be allowed for at the present day. The greatest live load accepted for traffic on the South Eastern and Chatham Railway during the war was about three times as high as the heaviest loads accepted in the early 'sixties, and, in view of the fact that when the Cannon Street bridge was built in the years 1865–66, it was not designed to withstand the weight of modern locomotives, traffic restrictions had to be imposed on the bridge prior to the strengthening to avoid the working stress being unduly high.

After investigation as to the loads which would be imposed on the London clay on which the piers are founded, it was decided that nothing need be done to strengthen the main supports, but it was found necessary to afford relief to the entire super-structure of the bridge. The various methods of strengthening the distributing sill girders over the piers were described, the design varying at each pier. The scheme adopted for strengthening the bridge platform consisted of the introduction of entirely new girders fixed between the existing ones, thus directly relieving the old girders of a considerable portion of load. The new and old girders were connected by rows of diaphragms, the object aimed at being to ensure that both worked in unison. As railway traffic had not to be interefered with on the bridge during the operations, and it was also necessary to avoid interference with the water-borne traffic on the river, these considerations influenced the design of the girders and materially affected the method of erection of the new work, as all the work had to be done below the surface of the bridge.

A full description was given of the temporary stagings which were constructed in the river from which the work was carried out, and the results of tests by direct loading which were made as to the supporting power of piles were mentioned.

Certain work on the main girders carrying a constant heavy dead load rendered necessary the exercise of great care, and the additional plating was done at night after traffic had ceased on the running roads above. The erection presented special difficulties on account of the restricted space in which it was necessary to work. Mr. Ellson described how the continuous girders, six in number, each weighing about 187½ tons, and of a length of 443 ft., were got into position, this being accomplished by threading them between the existing girders from the south span of the bridge. During the launching process it was necessary continually to adjust the height of the rollers on one or the other of the stagings, owing to the varying levels of the different spans of the

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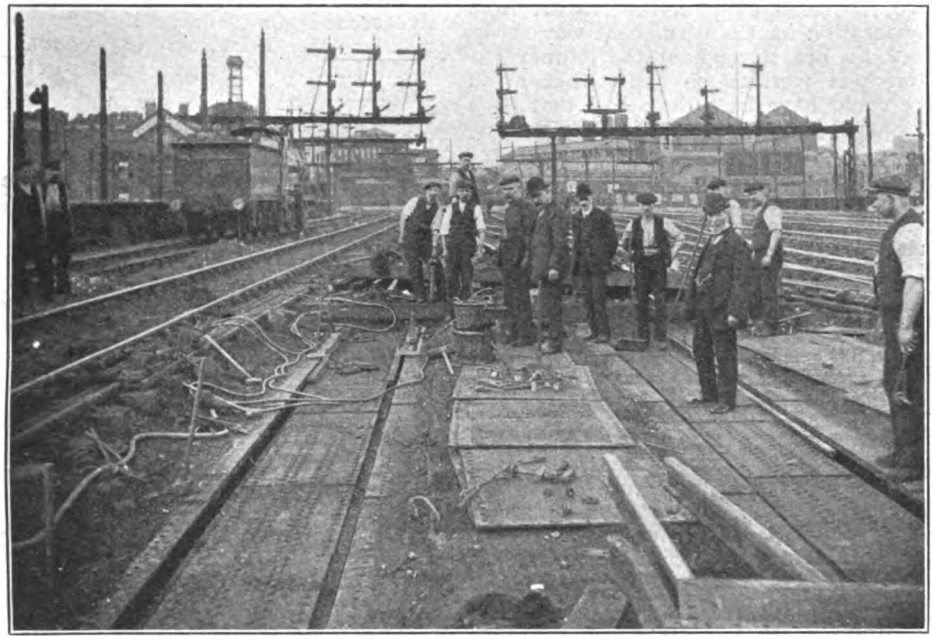
bridge, and also owing to the stops in the different layers of the flange plates. Great care was exercised so as to ensure that no set of rollers received more than its proper share of the load, the exact weight at any point of bearing being determined by means of hydraulic ship-jacks fitted with pressure gauges. The load shown thereby was checked against the calculated weight under similar conditions.

By the courtesy of Mr. Ellson we are able to reproduce the accompanying illustration. A number of locomotives were assembled for the purpose of testing the bridge after the strengthening was completed. For this purpose locomotives to the aggregate weight of over 800 tons were placed on parallel lines, those on each line being coupled together.



RENEWING FLOORING OVER NEW GIRDERS, CANNON STREET RAILWAY BRIDGE

Great Central Railway Locomotive No. 1165, "Valour."

RECENTLY we were privileged to travel on the footplate of this engine between London and Manchester, and although Driver Chapman, who has had charge of No. 1169 *Lord Faringdon*, No. 258 *Viscount Cross* and other well-known engines, did not set out to do more than schedule demanded, the running was of interest in many ways. The train was the 8·45 a.m. *ex*-Marylebone, and the load only five of the large bogie coaches, so that even allowing for the numerous stops and the smart stage timings of this train, the engine was barely loaded sufficiently to show its capabilities or to enable it to work under favourable conditions.

Starting easily, a severe permanent way slack was required at Neasden Junction, but Harrow was reached in 14¾ minutes. The run to Northwood, 4½ miles, was covered in 6 min. 50 sec.; and the hard stage of 24¼ miles to Aylesbury, including the slacks for Rickmansworth curve, and a very easy run into Aylesbury, in 32 min. 5 sec. The 16½ miles thence to Finmere took 20 min, start to stop, the short run to Brackley, 4¾ miles, 7 min. 10 sec. Thence to Woodford and Hinton, 19¾ miles, was run in 22½ min. and the Woodford-Rugby and Rugby-Leicester stages were covered respectively in 16½ min. (14 miles 12 chains) and 21½ min. (19¾ miles). The whole of this journey includes a considerable proportion of adverse gradient, so that the running was distinctly good, even for so powerful an engine, and notwithstanding that nothing beyond schedule running was attempted.

At Leicester one of the large vehicles had to be detached and replaced by two smaller bogie coaches, so that we left 12 min. late. Loughborough (9¾ miles) was reached in 13 min. 40 sec.; and some fast running was made thence to Arkwright St., that station being passed at reduced speed 15 minutes after leaving Loughborough (13¾ miles), and

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Victoria, Nottingham, reached in 17 min. 10 sec. Onwards to Sheffield careful running is almost continually called for, and the 38¼ miles were covered in a few seconds over 51 min. With an added bogie coach of the large type, Penistone was reached in 23 min. 10 sec. from Sheffield, 13 miles of continuous and severe up grade, and the 23½ miles thence to Guide Bridge, including the remainder of the ascent to Woodhead tunnel, careful running on the downward slopes beyond, several speed orders and one permanent way slack, were covered in 33½ min. Eventually London Road station was reached 9¼ minutes behind time.

Driver Chapman had not attempted to improve appreciably on schedule running, hence the small gain on time, apart from compensation for the permanent way slacks included; but throughout the journey the engine was working so easily that much more could have been done had that been necessary. Indeed, at all times, No. 1165 suggested an abundance of reserve power and a steadiness at high speed which indicated the capabilities of the engine as markedly as sensational speed performances would have done. At one time, so steadily was the engine running, an estimate that speed was 55–60 m.p.h., was followed by a stop-watch mile-post observation which gave 12·2 sec. for the quarter-mile, and a little further on 11·8 sec. were noted.

A Lightning Run.

RETURNING as a passenger, no special interest attached to the journey north of Leicester. Owing to special race traffic the 5 p.m. from London Road loaded to nine of the large bogie vehicles, but No. 1166 *Earl Haig* had no opportunity for showing its load capabilities, owing to the signal delays on the incline to Woodhead tunnel, due to relief trains in front. Joining the up Bradford dining car train at Sheffield, No. 358, a 4-4-2, with its load of five large cars, gave a good average run without special features, while delays between East Leake and Loughborough spoiled the running on that speedy section. At Leicester one of the new superheater 4-4-0 engines of the improved "Director" class was attached, No. 510 *Princess Mary*, and this engine gave a wonderful speed performance, notable even with the relatively moderate load.

The Rugby conditional stop was made, this stage of almost 20 miles, largely on ascending grades, being covered in 24½ min., start to stop. Thence to Woodford, a little over 14 miles, were run in 15½ min., again start to stop. Then followed the most exciting stage of the journey, as shown by the following times, with the station to station distances :—

		Distances m.	Distances ch.	Times H.	Times m.	Times s.
Woodford ..	.. dep.	—		8	46	20
Culworth ..	.. pass	2	78	8	51	0
Helmdon ..	.. ,,	3	48	8	55	5
Brackley ..	.. ,,	3	19	8	58	5
Finmere ..	.. ,,	4	64	9	2	5
Calvert ..	.. ,,	5	53	9	6	50
Grendon Underwood	,,	1	77	9	8	20
Akeman Street	.. ,,	2	47	9	10	40
Wotton ..	.. ,,	1	75		—	
Haddenham ..	.. ,,	5	31	9	17	40
Princes Risboro'	.. ,,	5	34	9	23	10
Saunderton ..	.. ,,	3	12	9	27	30
West Wycombe	.. ,,	2	59	9	30	0
High Wycombe	.. arr.	2	19	9	33	15

These times are taken only to the nearest five seconds, but analysed they give these results :—Woodford (start) to Grendon Underwood Junction (pass), 22 miles 19 chains in 22 min.; Culworth (pass) to Grendon Underwood (pass), 19 miles 21 chains in 17 min. 20 sec.; Woodford (start) to Princes Risborough (pass), 37 miles 46 chains, in 36 min. 50 sec.; Culworth (pass) to Princes Risborough (pass), 34 miles 48 chains, in 30 min. 10 sec.; Woodford (start) to High Wycombe (stop), 45 miles 56 chains, in 46 min. 55 sec. South of High Wycombe, too, some very fast running was made as far as Northolt Junction, the 16 miles 23 chains from High Wycombe being covered in 17 min, 20 sec., but a signal out of order near Neasden Junction, and other delays, caused us to reach Marylebone 16 min. behind time, having lost all the improvement upon the late departure from Leicester of 15¼ min. (due to the special traffic delays north of Leicester) which No. 510 had so noticeably accomplished.

Eight-Car Electric Trains on the District Railway.

IN the February RAILWAY MAGAZINE we described one of the new trailer cars placed in service on the Metropolitan District Railway, and we are now able to illustrate a complete 8-car train of motor, trailer and control-trailer coaches of the new stock as now running. Prior to taking up regular duties we were privileged to attend a private inspection and a demonstration run on the Hounslow branch. On that occasion, as intermediate stations were not served, a speed of about 50 m.p.h. was attained, and we were much impressed by the ease of riding both at speed, and when passing over points, and traversing curves. The motors are designed to give an acceleration of 1½ m.p.h., per second and to attain 45 m.p.h. after running one mile on the level.

The principal features of these cars have already been described, and the following

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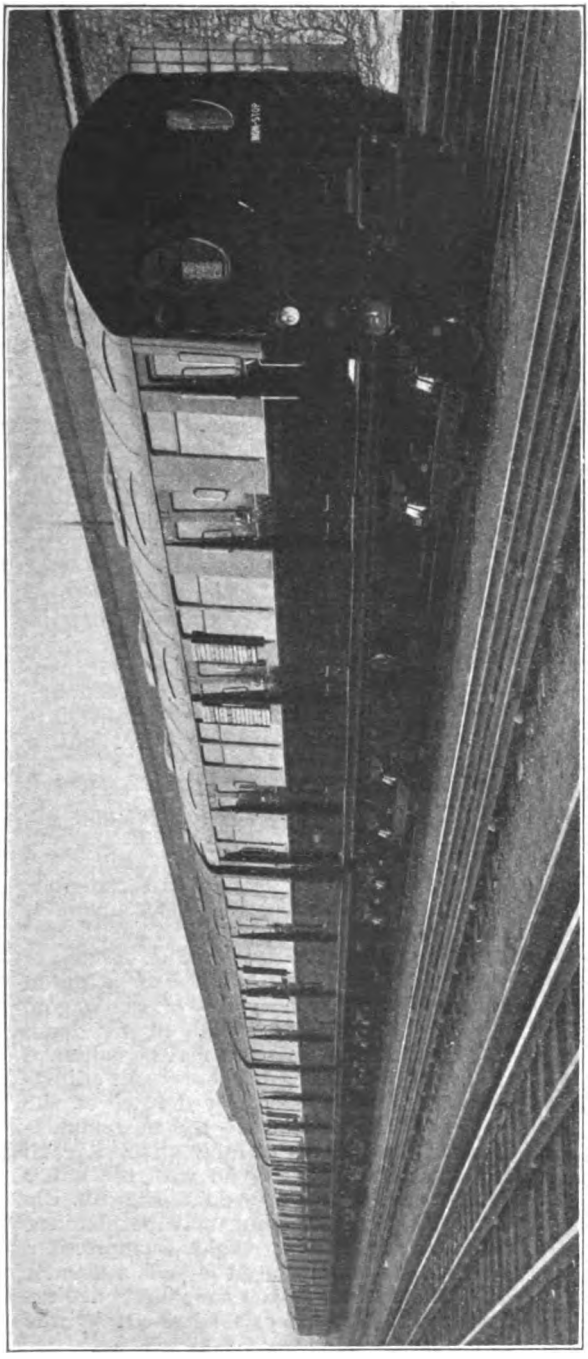

NEW EIGHT-CAR TRAIN, METROPOLITAN DISTRICT RAILWAY.

additional particulars may be briefly given :—

Length	..	49 ft. 2 in. over headstocks.
Width	..	9 ft. 6 in. over sole bars.
Height	..	11 ft. 11½ in. rail to roof.

Centre of bogies 34 ft.
Wheelbase centres—
{7 ft. 10 in. motor bogies
{7 ft. 3 in. trailer bogies

The weight of each motor car is 44 tons 10 cwt., the trailer car 24 tons 10 cwt., and the control trailers 25 tons 16 cwt.

The eight-car train comprises three motor cars, one control trailer car and four trailer cars, the formation being as follows :—Motor car, trailer car, control trailer car—motor car, three trailer cars, motor car, and it is intended that the eight-car train will run during the "rush" hours and the five-car "West End" portion at other times. The seating capacity of the trailer car is 48, the control trailer 44, and the motor car 40, so that the eight-car train has seating accommodation for over 300 passengers.

The cars are equipped with Westinghouse brakes on the double block system standard type, and provided with automatic adjustment for taking up any slackness. Hand brakes are fitted to all motor cars and control trailers. Main reservoirs are fitted to each motor car.

The motor cars are each equipped with four G.E. 260 motors, of the interpole tapped field self-ventilated type, and are rated at 198 h.p. for one hour, and 182 amperes continuously. Each pair of motors with its control gear constitutes a complete unit equipment. The control gear (mounted under the car) consists of circuit breaker, main switch, fuses, reverser, 15 contactors, resistances and tapped field relay. Other apparatus is substantially the same as previously used. Master controllers of an improved type

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are fitted at each end of each motor car, and at one end of each control trailer car.

The lighting scheme is most satisfactory, and the cars are electrically heated. The three double doors and the hand-hold pillars have already been fully described. We have since travelled in this train as an ordinary passenger, and the comments of others indicate that the new design and equipment is highly appreciated by travellers, and that as soon as other trains are also available, much will have been done to solve the London traffic problem as it exists on the Metropolitan District Railway.

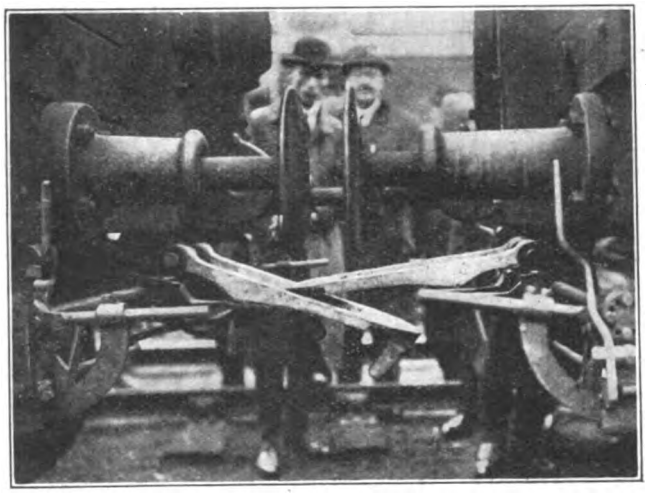

Photo.] [*Topical.*

BOONZAIER T-U-V. AUTOMATIC COUPLINGS ENGAGING AS WAGONS COME TOGETHER IN THE COURSE OF A SHUNT.

The Boonzaier T-U-V Automatic Coupling.

THIS device has been tested on several railways, and we recently attended a demonstration at Clapham Junction, two London and South Western Railway wagons having been equipped. The two wagons were coupled and uncoupled under varying traffic conditions, while it was also shown how the ordinary hooks and chains could be used for coupling up with other vehicles as will be necessary unless and until the special coupling becomes standard.

This coupling has been constructed so that it may be fitted as an accessory to couplings already in use on rolling-stock; it is secured to the existing drawgear so that it is clear and independent when not in use, and thus automatically provides the necessary requirements during the transition period. The action of the coupling is performed by one coupling member over-riding the other on contact, independent as to which, both being male and female combined. The coupling member comprises a combined hook and link and is secured by means of a fork or bracket to existing drawgear. It is supported on a carrier secured to a hand-rod, whereby it is operated by hand from either side of the car into one of two positions: effective for coupling; non-effective for uncoupling and shunting. The position of the carrier is vertically adjustable, allowing of ample provision for the variations in height. Normally the coupling automatically adapts itself in this direction to the extent of 4 to 5 in. The hand-rod is operated at each end by a handle having a slotted quadrant which becomes securely locked by a toggle-lever when the coupling is raised into its effective position and renders the latter incapable of automatic displacement. This toggle-lever is provided with a trigger at each side of the car, by pulling either of which it is raised, releases the quadrant and causes the coupling to uncouple and drop into its non-effective or shunting position.

To the fitting on each end of the hand-rod signalling apparatus is attached whereby the various effective and non-effective positions of the coupling are readily ascertainable, even from a distance, and the coupling is rendered entirely fool-proof. Longitudinal adjustment is provided for by means of a male and female screwed member actuated by gearing from either side of the wagon, whereby it may be advanced for loose coupling or uncoupling and may be tightened up for tight-coupling purposes. An adjustable distance-rod is employed to check the degree of advancement. By the employment of two levers suitably pivoted, each having contact at one end with the buffer shaft and at the opposite end with the draw bar, tight coupling may be obtained automatically under slight compression. These levers are arranged in such a manner that their action on the coupling is neutralised when the latter is advanced by the screw-gear.

The inventor is Mr. W. G. Boonzaier, of 11, Bramfield Road, London, S.W. 11.

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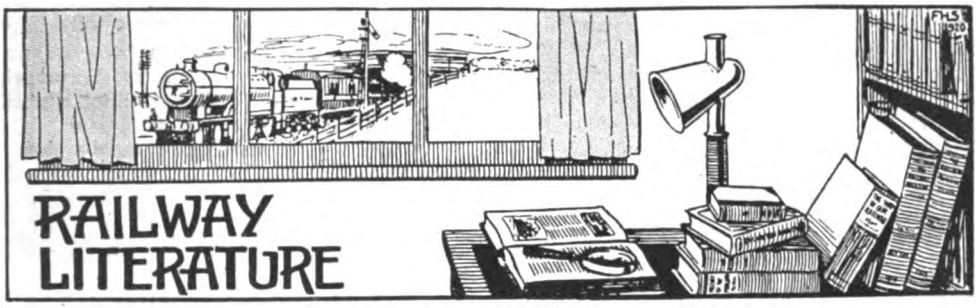

RAILWAY THEFTS: TO WHOM IT MAY CONCERN. [By E. S. Hadley, 46, Milton Road, Hanwell, London, W. 7. Price 6d. net.] Stated to be "A Book for Railwaymen," the author, who is well-known in Great Western Railway service, opens by a confession of his own early days. "One day I stole a plum. . . . That plum nearly cost me my job and my character. I did not know it, but a concealed detective was watching me. A second thought happened to strike me. I changed my mind—and put the plum back. The detective saw that, too." That was nearly 30 years ago, and Mr. Hadley goes on to say: "During those thirty years I have seen many a man 'go under' as simply and almost as cheaply as I very nearly went. Many more will similarly 'go under' unless—*Unless what*? This book is the answer." The author then proceeds to describe how many a railway man has "gone under," discusses various aspects and showing how, in the end, dishonesty is almost certain to be found out, the thief and pilferer rarely gains in the end, and that theft in the railway service does not pay. Incidentally he reveals some of the methods adopted by railway companies to combat the thieving and pilfering tendencies which are, unfortunately more frequent than is desirable, and we can commend this little booklet to readers, though probably, and we hope not at all, few if any require the sound advice and admonition which Mr. Hadley places before them.

BRITISH RAILWAYS AND THE GREAT WAR. By E. A. Pratt. [Selwyn & Blount. Price 3s. 6d. net]. Part II of this useful serial is now available. It continues the story of the special services rendered by the railways during the war, with chapters on Mobilisation, the B.E.F., Troop Traffic arrangements, Restrictions on travel, Demobilisation, &c. dealing very completely with the special notices, &c., applying under these headings. Part III, since issued, includes chapters on Military Ambulance trains, Railways and Coasting Services, Free Transport and Free Services, Belgian Refugees, &c.

THE HANDY BOYS' BOOK. By J. Barnard and others. [Ward, Lock & Co., Limited. Price 6s. net]. This volume will be welcomed by a wide range of readers, and while the authors, Mr. J. Barnard, "assisted by many experts," have written directly for the "handy boy," we can imagine a much wider circle who will appreciate the clear and simple explanations, and the numerous drawings, diagrams and other illustrations. Designed for the boy who is anxious to use his hands, the book covers a considerable range, largely of directly practical application, but also catering for nearly every hobby and taste. Home carpentry, painting, staining, picture mounting and framing, and "some useful things to do in the house" are first considered. Useful articles easily made, electric bells, telephones, and wireless apparatus are further considered. Model working is an important section, and Mr. H. Greenly describes the construction of cardboard, wooden and metal locomotives. The young scientist, the care of pets, knots and how to tie them, care of motor cycles, photography, &c., are considered in other sections of this interesting and useful volume. It is well bound, and plentifully illustrated with photographs and diagams.

CHART OF 4-6-0 FOUR CYLINDER LOCOMOTIVE, GREAT WESTERN RAILWAY. [The Locomotive Publishing Company, Limited. Price 2s net.]. This chart, showing on a large scale a longitudinal section, adapted to include other parts, will be welcomed by all students of locomotive engineering, and those interested in these famous engines. A key and table of all the parts enable very complete reference to be made.

UNDERGROUND ANNOUNCEMENTS. A neat folder, issued from Electric Railway House, reproducing extracts from the newspapers. Some of the titles are: "Count the K's," "London Street Cries," "Winter Furze," and "An Automatic World." A section on "Employment" shows that since 1914

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the Underground staff has increased by 884 on train working, 702 in the workshops, and 967 on the motor omnibuses. A further issue gives interesting facts concerning the new "Underground" organisation, and the results for 1920, with miscellaneous items under the titles: "Kingfishers in London," "Honesty," "Through Tickets at Victoria," "The Way the Money Goes" (with comparative diagrams), "The Law and Omnibuses," "Underground Electric Cars" &c.

THE GERM PROCESS IN A NUTSHELL. [Henry Wells Oil Company, 11, Haymarket, London, S.W. 1]. This pamphlet describes the "Germ" process as it appeals to the lubricating oil user. Copies can be obtained by responsible applicants from the firm named.

INSTITUTE OF TRANSPORT.

QUALIFICATIONS FOR CORPORATE MEMBERSHIP.

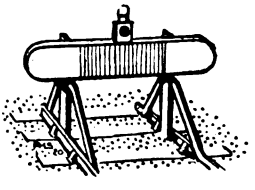
WE are advised that pending the coming into force of an entrance examination scheme as an alternative to election based on the qualifying periods stipulated in the Articles of Association, viz., ten years' and five years' official responsibility for full and associate membership, respectively, and having in mind the marked differences in nomenclature and responsibility of officials serving various transport undertakings, the Council of the Institute has approved of eligibility for membership being considered, firstly, in regard to the position held by an applicant, as set forth below, and secondly, the holding of a position of agreed responsibility, not for ten or five years respectively, but with ten or five years, respectively, of back service in recognised established positions prior to or including the applicant's present position or positions.

In regard to the principal main line railways the positions concerned are classified generally as follows:—

Members:—General manager, principal assistants; chief engineer, principal assistants; chief mechanical engineer, assistant mechanical engineer, locomotive running superintendent, superintendent of the line, assistant superintendent of the line, chief goods manager, assistant goods manager, outdoor goods manager, mineral traffic manager, chief of goods cartage and motor sections, electrical engineer, assistant electrical engineer, carriage superintendent, wagon superintendent, marine superintendent, district traffic superintendent, district goods manager and divisional engineer.

Associate Members:—Superintendent of rolling-stock, chief clerks to general manager, chief goods manager and superintendent of the line, assistant district superintendent, assistant district goods manager, assistant divisional engineer.

Members signing applications in future are desired to keep the above classification in mind. In pursuance of the foregoing decision a number of transfers from associate to full membership, and from the class of graduate to that of associate member, have been sanctioned.



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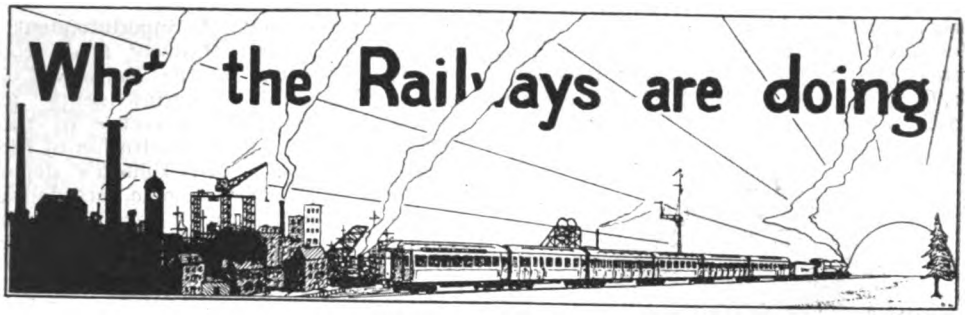

MR. H. L. THORNHILL, who was on March 1 appointed Solicitor to the London and North Western Railway in succession to Mr. M. C. Tait, has been Assistant Solicitor to the company since May, 1915. He was articled in 1894 to the late Mr. C. H. Mason, who was then Solicitor to the London and North Western Railway. In April, 1899, Mr. Thornhill was appointed Assistant in the Common Law Department, and in 1903 became Parliamentary Assistant under Mr. C. de J. Andrewes, who was in that year appointed Solicitor to the company. In this capacity Mr. Thornhill also acquired an extensive experience of Railway and Canal Commission practice. He was away from January, 1915, to April, 1919, on service in France, and during his absence was appointed Assistant Solicitor when Mr. M. C. Tait succeeded Mr. Andrewes as Solicitor in May, 1915. Mr. Thornhill went to the United States in May, 1920, with Mr. Geoffrey Marshall, Goods Manager of the Great Northern Railway, to study and report on the principles of railway rates. He gave evidence before the Rates Advisory Committee on behalf of the Railway Companies' Association with reference to proposed changes in railway law.

MR. H. L. THORNHILL,
Solicitor,
London & North Western Railway.

* * *

AT the fourth annual general meeting of the London "Safety First" Council various committees were appointed. The Railway "Safety" Committee includes the following well-known representatives from the railway world: Mr. G. H. Dennis (Chairman), Publicity Manager, London, Brighton & South Coast Railway; Mr. G. F. Thurston (Vice-Chairman), Secretary, Great Eastern Railway; Mr. E. A. Evans, Publicity Department, Great Eastern Railway; Mr. E. Falconer, Goods Operating Superintendent, Midland Railway; Mr. Murray Griffith, Director, Metropolitan District Railway; Mr. E. S. Hadley, General Manager's Department, Great Western Railway; Mr. W. Holt, Traffic Superintendent, Metropolitan Railway; Mr. F. H. Hopper, Cartage Superintendent, South Eastern & Chatham Railway; Mr. R. O. Roberts, L.C.C.; Mr. J. P. Thomas, Operating Manager (Railways), "Underground" Companies; and Mr. J. Thornton, Superintendent of the Line, "Underground" Companies.

* * *

MR. C. L. G. WAYNE, the Traffic Manager of the Shanghai-Nanking and Shanghai - Hangchow-Ningpo Railways, has been granted six months' furlough by the Ministry of Communications, Peking. Mr. Wayne also acted as General Manager of the Shanghai-Nanking Railway during Mr. A. C. Clear's absence on long leave during 1920. Mr. W. A. Richardson, the Assistant Traffic Manager, has been appointed to act as Traffic Manager of the two lines whilst Mr. Wayne is away.

* * *

AT the eighth annual general meeting of the Institution of Railway Signal Engineers

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(Incorporated) held at the Midland Grand Hotel, St. Pancras, the following officers were elected for the ensuing year: President, Mr. C. H. Ellison, Telegraph Superintendent, North Eastern Railway; Vice-President,

MR. C. H. ELLISON,

President of the Institution of Railway Signal Engineers.

Mr. W. C. Acfield, O.B.E., Signal Superintendent, Midland Railway; Hon. Treasurer, Mr. R. J. Insell, Chief Assistant Signal Engineer, Great Western Signal Department, Reading; Hon. Secretary, Mr. M. G. Tweedie, A.M.I.E.E., Great Western Railway Signal Department, 80, Caversham Road, Reading. Ten new members were elected. The object of this Institution is the study and advancement of railway signalling, and its membership embraces all branches of the signal engineering and allied professions. The annual subscription is one guinea for full membership, 10s. 6d. associate members, and 7s. 6d. for student members.

* * *

MR. C. H. ELLISON, Telegraph Superintendent of the North Eastern Railway, who has been appointed President for 1921–22 of the Institution of Railway Signal Engineers, has been a member of the Institution since 1913. He was elected a Vice-President at the annual meeting in February, 1915, and, owing to the desirability that no change of officers should be made during the war, he has acted as Vice-President for five years. The new President has been the Telegraph Superintendent of the North Eastern Railway since 1902, was the President of the Railway Companies' Telegraph Superintendents and Electrical Engineers' Conference in 1908, and is a member of the Institution of Electrical Engineers. Mr. Ellison's department was responsible for some very delicate work in connection with munitions and, during the war, on the occasion of a visit of the King and Queen to the North of England, Mr. Ellison was received by their Majesties in the Royal saloon and presented by the Queen with a tie-pin bearing the initials G. &. M in diamonds as a souvenir of the occasion.

* * *

MR. J. C MITCHELL, Treasurer of the Underground Electric Railways Company of London, Limited, has been appointed Secretary of the combine while retaining his present duties. Mr. Mitchell, who was born in April, 1867, has spent practically all his business life in the passenger transport trade of London. He commenced on the staff of the London Road Car Company, Limited, in 1886, and became Secretary of that company in 1905. Three years later, on the amalgama-

MR. J. C. MITCHELL,

Secretary and Treasurer, Underground Electric Railways Company of London, Limited, and Associated Companies.

tion of the omnibus trade in London, Mr. Mitchell was appointed Secretary of the London General Omnibus Company, Limited. He was also liquidator when the Vanguard

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Company became amalgamated, and in 1912, when the interests of the London General Omnibus Company were combined with those of the Underground Electric Railways of London, Limited, Mr. Mitchell became Comptroller of the latter company. and shortly afterwards was appointed Treasurer of the "Underground" Company and allied concerns. From 1914 until 1916 Mr. Mitchell was Vice-President of the Chartered Institute of Secretaries and he occupied the Presidential chair during 1917.

* * *

THE results of working the controlled railways in the United Kingdom during the nine months, April to December, 1920, show that the total claims made on the Government were: Great Britain, £30,711,226; Ireland, £1,814,637; and for the United Kingdom, £32,525,863. On railway working, receipts during the nine months exceeded expenditure by £6,539,242, but many items included in this expenditure were not strictly proper to the period. Apart from the depression in trade and the exceptionally high costs of labour and material which prevailed throughout last year, other abnormal factors account for about £20,000,000 out of the claim for £32,500,000.

* * *

AT the fifth meeting of the sixth series of efficiency meetings, held on February 21, in the London General Omnibus Company Training School, Milman Street, Chelsea, Mr. H. E. Blain, C.B.E., Assistant Managing Director, presided over an attendance of upwards of 300 members of the administrative and control staffs. The paper on this occasion, entitled "Lifts and Escalators," was given by Mr. W. S. Graff Baker, Electrical Assistant to the Mechanical Engineer, Underground Railways. It was illustrated by a large number of slides showing the mechanism and working of both lifts and escalators, and was much appreciated. At its conclusion, a general discussion was opened by Mr. S. T. Trigg, Assistant Superintendent of the Line (Outdoor), Mr. J. Morgan, Senior District Inspector, City and South London Railway, and Mr. D. Williams, Senior District Inspector, Bakerloo Railway, and was freely joined in by others who made notably practical contributions to the debate. The importance of the subject may be realised from the fact that nearly 1,000,000 passengers are carried by the lifts and escalators on the Underground railways every week-day. Additional landing control equipment is being installed at the heaviest stations and automatic syren control at the light stations.

FORMED little more than twelve months ago, the T.O.T. Philharmonic Society, scored a great success on the occasion of the fourth public appearance of the combined military bands, orchestra and choirs associated with the various "Underground" companies; and on Wednesday, February 23, the Queen's Hall was filled with a large gathering by whom the work of the 400 performers was enthusiastically received and highly appreciated. The proceedings included band and orchestra selections, choral pieces, both accompanied and with the voices alone; and solo items by Miss Sylva Van Dyck (soprano), Miss May Windsor (entertainer), Mr. Charles Knowles (baritone), and Mr. Rupert Hazell (entertainer), while Mr. J. A. Meale, F.R.C.O., musical director to the Society, rendered organ solos, and his reception indicated the high appreciation in which he is held, by choir and band and public alike. A long and ambitious programme was carried out in splendid style, and though encores were frequent in the first part, they were all fully justified. The conductors were: Messrs. Ernest Beech, F. Dingle, and A. Goodfellow; while an overture tone poem, "The Dawn of Peace," was conducted by the composer, Lieut. J. Ord Hume, L.F. The accompanists were Messrs. P. Thwaites, E. T. Butteriss, G. Murlis (choir), and T. Judd (L.U.T. Band), while Mr. A. E. Musgrove officiated at the organ, giving also a short recital before the commencement of the concert. The services of Mr. S. Pinegar, orchestra conductor Mr. J. Johnson, conductor, A.E.C. choir and orchestra; and Mr. A. R. Wellington, platform manager, also contributed very materially to the success of the proceedings. The front cover of the programme, a fine piece of draughtsmanship, had been designed by Messrs. B. G. Lewis and E. Hunt, members of the Society, and was adjudged the best of many submitted in competition for a prize inaugurated by the Committee.

* * *

At the concert recorded in the foregoing paragraph the audience included directors and officers of the T.O.T. companies, with representatives from other systems, of whom the following may be mentioned: "Underground" companies—Lord (and Lady) Ashfield, Chairman and Managing Director; Mr. H. A. Vernet, Col. Sir Herbert Jekyll, Mr. Murray Griffith, Directors; Mr. H. E. Blain, C.B.E., and Mr. Frank Pick, Assistant Managing Directors; Mr. Z. E. Knapp, Director for Construction (Railways); Mr. W. A. Agnew, Chief Mechanical Engineer; Mr. A. L. Barber, Commercial Manager; Mr. A. R. Cooper, Chief Engineer (Railways); Mr.

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W. S. Every, Signal Engineer; Mr. C. S. Louch, Comptroller and Accountant; Mr. G. J. Shave, Operating Manager (L.G.O.C.); Mr. C. J. Spencer, General Manager (Tramways); Mr. J. P. Thomas, Operating Manager (Railways); Mr. J. Thornton, Superintendent of the Line: Mr. S. J. Webb, Chief Passenger Agent and Fares Officer. Great Eastern Railway—Col. W. Johnson Galloway, Director, and Mr. A. W. Headley, Chief Clerk to the Chief Mechanical Engineer (respectively Hon. Conductor and General Secretary, Great Eastern Railway Musical Society). London, Brighton and South Coast Railway—Mr. J. Forbes, Assistant Superintendent of the Line. On the conclusion of the entertainment Lady Ashfield presented, on behalf of the members of the Committee and Choir, &c., of the T.O.T. Philharmonic Society, a gold watch to Mr. Ewart Beech, the conductor of the combined choir, as a mark of appreciation of his splendid work at rehearsals, and in conducting, which had led to the development and continued success of the Society.

* * *

On Wednesday, March 2, the orchestra of the Great Eastern Railway Musical Society, gave the last of the season's concerts in the Hamilton Hall of the Great Eastern Railway Hotel. The chair was occupied by Mrs. S. A. Parnwell, the wife of the Assistant General Manager, to whom a hearty vote of thanks was accorded on the motion of Colonel Galloway, the Society's Honorary Conductor, to which Mr. Parnwell replied on his wife's behalf. As a souvenir of the occasion, Mrs. Parnwell was presented with a silver and ivory chairman's mallet, suitably inscribed. The playing of the orchestra reached a high standard of excellence particularly in the Schubert "Unfinished" symphony. The large audience was further delighted with the excellent vocal selections rendered by Miss Gertrude Higgs and Mr. Frank Webster. The concert was ably conducted by Colonel Galloway; and Mr. Sydney Harrington, F.R.C.O., of the Chief Mechanical Engineer's Department, proved an able accompanist.

* * *

At the March meeting of the Railway Club Mr. Kenneth Brown presented a brilliant paper entitled "Railways-in-law; Grains of railway history gleaned from the Law Reports." The subject of the law in regard to railways is generally supposed to be dull, but Mr. Brown gave his audience a most entertaining and historically interesting account of the early and troubled days of a number of the less fortunate lines. In addition to bringing forth a mass of curious and little-known information, the paper was delightfully humorous and was greatly enjoyed by the members present, who showed by their hearty appreciation of Mr. Brown's paper that their interest extends to *all* branches of railway work. At the April meeting, Mr. D. H. F. Meacock will read a paper on "Railway Publicity," and Mr. Cecil J. Allen will be the lecturer for the May meeting. After this, meetings will be discontinued until September, and in their stead there will be during the summer months an attractive programme of visits to places of railway interest.

* * *

Founded in 1854 the Great Northern Railway Literary Society shows no sign of senile decay, but on the contrary is an extremely active organisation. Managed by a president, vice-presidents, and a committee of 20 members, it is open to all grades of the clerical staff, and at present it numbers about 850 members. The advantages the society offers include a library of 6,000 volumes; the leading newspapers, periodicals and magazines; a large billiard room with four full-sized tables; a reading and tea room; a chess and draughts room. The great event of the year is the smoking concert. The first of these functions was held at the Freemasons Tavern on May 5, 1887, under the chairmanship of Lord Colville of Culross. Year by year the concerts increased in popularity and from 1898 onwards the Queen's Hall, Langham Place, W., was found to be the only suitable public concert hall capable of accommodating the staff and their friends. The object of the concert is to afford an opportunity for meeting of members of the Society and staff, and their friends, and every effort is made by the committee to provide a high-class entertainment which may meet the requirements of those who prefer a bright variety entertainment as well as those who demand more classical music.

* * *

The concert, which took place on Friday March 11, was as successful as any of its predecessors. The Queen's Hall was filled with a very large audience, and the programme in variety of interest, in excellence, and in length, could hardly have been improved. In it figured the names of Miss Dorothy Greene, Miss Edith Furmedge, the Misses L. and M. Chisholm, Mr. Stewart Gardner, Mr. George Mozart, Miss Lois Barker, and Mr. Percy Tarling, Messrs. Lloyd Shakespeare and Ernest Rutterford, Mr. Fred Wildon, Mr. Ben Lawes, and Mr. Harry Hearne, who provided among them as great a feast of music and of humour

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as the most exacting could desire. Mr. Herbert Cooke and Mr. David Richards were the accompanists, and Sir Frederick Banbury, who took the chair, made an excellent speech, though he had perforce to remark that, as regards the future, he knew very little, and that he couldn't tell.

* * *

VERY hearty congratulations must be tendered to Mr. F. Y. Marrian, the Hon. Secretary, to the Literary Society and to Mr. H. Jude, the Chairman of the Concert Committee. Not only was the concert a great success, but a very influential gathering of railway directors and officers was included in the audience. Among them were (directors) the Rt. Hon. The Earl of Ancaster, and Lieut.-Col. the Hon F. S. Jackson, M.P., supporting the genial chairman, the Rt. Hon. Sir Frederick Banbury, Bart., M.P. Officers, Great Northern Railway:—C. H. Dent, E. Burrows, R. Hill Dawe, C. J. Selway, C. L. Edwards, H. N. Gresley, C. J. Brown, A. J. Brickwell, J. W. Faulkner, A. Lamb, A. Fergusson, T. Smith, L. Brightman, F. H. London, T. A. Painter, G. H. Coulson, and E. Notter. Ex-officers of the Company W. J. Grinling and G. Shaw. In addition to Mr. P. H. Price, representing the Railway Clearing House, there were also present Mr. F. Tatlow, General Manager, Midland Railway; Mr. E. C. Cox, Superintendent, South Eastern and Chatham Railway; Mr. C. H. Stemp, Operating Superintendent, North British Railway; and Mr. J. W. Ogle, Traffic Superintendent (Lahore), North Western Railway, India.

* * *

MUCH has been said and written of late concerning the pilferage of goods in transit by railway, but at the same time there are those who incline to the idea that railwaymen are no more honest or dishonest, as the case may be, than they were in pre-war days. True, through the increase in the money value of goods, the claims paid for pilferage of merchandise in transit represent much larger sums, but it is a question whether railwaymen, as a class, really have become as dishonest as is represented in some quarters. The fact is the railway service, like other public services, has always included in its ranks here and there a man deficient in respect for other people's property. Mr. Joseph Tatlow, in his excellent biography,* "Fifty Years of Railway Life in England, Scotland and Ireland," tells a good story that is to the point. When Sir Edward Watkin was General Manager of the Manchester, Sheffield and Lincolnshire Railway (he was Mr. Watkin then) many complaints had arisen from coal merchants on the line that coal was being stolen from wagons in transit by engine drivers. Nothing so disgraceful could possibly occur, always answered Mr. Watkin. Down the line one day, with his officers at a country station, a driver was seen in the very act of transferring from a coal wagon standing on an outlying siding some good big lumps to his tender. This was pointed out to Mr. Watkin, who only said: "The d——d fool, *in broad daylight*!"

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* * *

AT the recent meeting of the proprietors of the Isle of Man Railway, the chairman, Mr. E. T. Kissack, pointed out that there was an increase in wages of £13,260 10s. 4d. during the past year, and as part of this increase commenced last July, the current year would suffer to an even greater extent, unless in the meantime some reduction took place. The total growth under this head since 1913 amounted to £22,524 7s. 6d., so that now their gross receipts during the winter months were not anything like sufficient to pay working expenses. They were now absolutely dependent on the few months of summer traffic to make their profit.

* * *

IN the House of Commons on March 3, the Minister of Transport was asked whether certain of the British railways were now seeking to place orders for steel rails in France and Belgium; and if so, in view of the fact that if these orders were placed with British manufacturers they would find work for many hundreds of men now out of employment in this industry, he would consider the possibility of making representations to the companies concerned in the matter. In reply Mr. Neal said: I understand that tenders have been received by various companies for rails from Belgium at prices greatly below those offered by English firms. It is the consistent policy of the Minister of Transport not to interfere with the prudent discretion of the companies in such matters, and, when asked for his views by the companies, he replied in that sense. But I am sure that, in placing orders, the companies will now, as in the past, take into consideration the importance of securing employment in this country and of assisting the prosperity of the districts which they serve. It is not, however, possible for the railway companies, in placing orders for materials, to disregard serious differences in the prices quoted, and it is on the balance of these considerations

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that their decision must be based. The prices given at the time were:—Home production, £23; Belgian, f.o.b. British port, £12.

* * *

So popular is the Metropolitan District Railway Ealing express—which leaves Mansion House at 5.7 p.m. and runs non-stop from Sloane Square to Acton Town, making the complete journey in 30 minutes—that it has become necessary to increase the length of this train from six to eight cars.

* * *

A NEW series of four-cylinder passenger engines ("Claughton" class) will shortly be in London and North Western Railway service, as follows: Nos. 15, 23, 30, 32, 42, 63, 68, 102, 110 and 119. The 0-6-2 coal tank engines which previously bore these numbers are now in the duplicate list as Nos. 3701–10 inclusive. Two additional engines of the 2-8-0 type have been taken over on loan from the Ministry of Munitions and allotted the numbers 2979 and 2980. In the R.O.D. list they were numbered 1859 and 1887 respectively. The old 6-ft. single-wheel passenger engine *Engineer South Wales* has been withdrawn, but is not yet broken up. We understand its place is being taken by the 6-ft. "Jumbo" No. 485 *Euxine*. Nos. 1933 *Barfleur* and 1975 *Jupiter*, four-cylinder compounds, have been converted to "Renown" class two-cylinder simple.

* * *

A READER in Nigeria commenting upon an illustration reproduced in the October, 1920, RAILWAY MAGAZINE, showing a Nigerian 4-6-0 locomotive, points out that these do not represent the largest and most powerful classes in use on those lines. There are, in fact, three 4-8-0 and one 4-8-2 tender designs in use. The former include mixed traffic and heavy goods classes, and differ in many respects one from another. Our correspondent mentions that frequently the coal trains run more punctually than the passenger trains, owing to the fact that they make longer runs and then stop mainly for locomotive purposes, while the latter call every 10 miles or so and are more liable to delays at stations due to traffic. The Canadian 4-8-2's are approximately equivalent to the larger of the English 4-8-0's, and were obtained at a time when deliveries from the home builders could not be had.

* * *

AN Indian reader, Mr. W. Machin, of Lucknow, sends particulars of the locomotive working adopted on the occasion of State journeys in Bengal by the Duke of Connaught. Between Nagpur and Bilaspur, on the Bengal-Nagpur Railway the work was done by two 4-6-0 superheater engines named *The Duke of Connaught* and *Strathearn* respectively. Two similar engines were used between Bilaspur and Chakardharpur. Thence to Howrah the royal special was worked by a 4-4-2 de Glehn compound engine. All the engines were painted royal blue, picked out with scarlet lines, with the royal coat-of-arms fixed in front of the smoke-box door, and on the sides of the tenders.

* * *

Two Edinburgh readers, Mr. T. M. S. Findlater and Mr. R. R. Baker, write in reference to new North British Railway locomotives, giving particulars of the latest additions to the "Scott" class: Nos. 497 *Peter Poundtext*, 498 *Father Ambrose*, 499 *Wandering Willie*, 500 *Black Duncan*, and 501 *Simon Glover*. The former gentleman remarks that engines Nos. 312, 730 and 737 were rebuilt last year. Also that the North Eastern Railway "Uniflow" 4-4-2 engine No. 2212, recently mentioned as being painted lead colour, has now appeared in the usual green livery.

* * *

A FEATURE of traffic working in the Bristol district of the Great Western Railway for some time past has been the general use on local passenger services of the 0-6-0 pannier tank engines—originally built as saddle tanks. These engines seem destined to supersede to some extent the 2-4-0 side tank locomotives, though these are still constantly in evidence at Temple Meads station. The 0-6-0 engines mentioned above, were extensively used on goods and mineral traffic some 25 years ago; but on such heavy duties they are seldom seen to-day. They have been replaced, in long-distance traffic working, by the 2-6-0, 2-6-2 and 2-8-0 types—the last class including both tank and tender locomotives—but are still favourites for shunting work.

* * *

TRAVELLERS on the suburban lines of the South Eastern and Chatham Railway have recently had their curiosity excited by the number of white posts they have seen erected on the railway track. These posts have been put up in connection with the enquiries which are being made by a committee of the company's staff appointed to investigate the working of the suburban traffic during the peak hours with a view to increasing the carrying capacity of the line. Each post is located at the end of a certain distance beyond the signal, viz., at the treadle of the section at the rear of

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that signal. This is the point which the first wheel of an engine of any train must pass over before the next following train can be accepted to pass the second effective signal to the rear of the first train. Surmounted by triangles bearing letters indicating the line to which they refer, the posts are numbered consecutively, section by section, in the same direction as the train is travelling. It will therefore be seen that by taking passing times at the posts it is possible to ascertain how long a train occupies the line, section by section.

* * *

RAILWAYS serving Stratford-upon-Avon may anticipate a busy time during the forthcoming Shakespeare Birthday Festival, which opens on Saturday evening, April 23. At the Memorial Theatre performances will be given by the New Shakespeare Company under the direction of Mr. W. Bridges-Adams and organised by a committee with Sir Johnston Forbes-Robertson as the chairman. The festival will be continued until May 21. The birthday play will be "Antony and Cleopatra," and other plays include "A Midsummer Night's Dream," "As You Like It," "King Richard the Third," "Macbeth," and "The Merry Wives of Windsor." At the Shakespeare Hotel, now under the proprietorship of Major Fairbanks Smith, special steps will be taken to ensure the comfort and convenience of visitors. This hotel is famous for its Christmas and Easter festivities. RAILWAY MAGAZINE readers desiring further particulars should apply to Mr. A. E. Diggins, General Manager, S.M.J.Railway, Stratford-upon-Avon.

* * *

THAT Yorkshire and Lancashire contain within their far-flung borders many a hive of industrial activity is well-known throughout the United Kingdom, but the attractions that these counties of the white rose and the red have to offer the tourist and holiday maker other than their various coast resorts are not so much common knowledge. A well illustrated booklet, entitled "The Lancashire and Yorkshire Moorlands and the Brontë Country," just issued by the Lancashire and Yorkshire Railway should do much to dispel ignorance in this direction. RAILWAY MAGAZINE readers should secure a copy of the book, which will reveal to many a *terra incognita* for holiday making. It is distributed gratuitously by Mr. Ashton Davies, Superintendent of the Line, Lancashire and Yorkshire Railway, Manchester, who will likewise provide particulars of accommodation for visitors in the Hardcastle Crags district, also information as to train services. Mr. Ashton Davies loans free to *bona fide* lecturers a set of lantern slides, with descriptive matter dealing with the Hebden Valley, Hardcastle Crags and the surrounding moorland country

* * *

THE proceedings of the Rates Advisory Committee in relation to the new classification of goods for transport by rail passed into a new stage on February 28, when the time for traders sending in objections to the railway companies' proposals expired. The Joint Committee appointed by the Association of British Chambers of Commerce and the Federation of British Industries and the other leading Associations have in hand a large number of applications from traders received from all parts of the country and are engaged upon co-ordinating and consolidating the various proposals with the view of facilitating the work of the Rates Advisory Committee. The next step will be for the railway companies to take into consideration the objections made by the traders to their proposals, and as soon as they have had sufficient time for this purpose, meetings will be arranged between committees of the railway companies and the representatives of the traders to ascertain how far agreement can be arrived at between the parties. Those cases which cannot be disposed of by agreement will come before the Rates Advisory Committee for adjudication, but it is not thought that the hearings for this purpose can take place before the month of May.

* * *

IN connection with the song recently published by Messrs. Herman Darewski, entitled "My Little Metro-land Home," the firm have fitted their window in Charing Cross Road, London, with a miniature model railway, with carriages electrically driven. There is an illuminated scenic view at the rear. This will interest most RAILWAY MAGAZINE readers who can find it convenient to inspect the window, particularly those who reside on the Metropolitan Railway extension.

* * *

SPEAKING at Cambridge on Tuesday, March 8, the Minister of Transport, Sir Eric Geddes, after referring to his coming retirement from parliamentary life in August next, commented upon the despairing letters he received from old ladies who held railway shares in which they said they were ruined Sir Eric said that despair was due to the pessimistic speeches of railway chairmen, who made out that the railways only earned six millions a year, whereas before the war they earned 47 millions. That was an

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absolute misrepresentation of facts. If these were the facts, then he agreed that the outlook for the railway shareholders would be black. The arrears which accumulated in the early days of the war were being overtaken. To take the earnings of the railways in a time of great trade depression when reduced by £8,000,000 on account of a coal strike, and then debit to those earnings not only the economical expenditure absolutely necessary during the year, but the fullest rate of expenditure in the best year in their history, and then add to that £10,000,000 to £15,000,000, which was wiping off old debts, was no true way to say what railways were earning. Some railways thought that as they had got a very serious and very momentous bargain to strike with the Government between now and August and discuss in Parliament, it was a useful thing to appear in rags so as to excite the commiseration of the court.

* * *

At Cambridge on Wednesday, March 9, Sir Eric Geddes denounced railway nationalisation. "I do not believe," said he, "this country could stand nationalisation for five years. It would ruin the country. I have never believed in nationalisation; I was always against it, and since 1918 I have had two years' experience of Government working and Parliamentary working, and there is no greater curse could ever come to this country than nationalisation of the railways." He concluding by remarking that he stood for private management.

* * *

At the Institute of Transport meeting, held on March 8, Mr. Philip Burtt, Lecturer, London School of Economics and formerly Deputy General Manager, North Eastern Railway, read a paper entitled "Inter-dependence of the various forms of Transport." Mr. Burtt outlined the relationship between ocean transport and railway traffic, discussed the question of light railways, with special reference to the railways of Belgium, described the growth of roadway services, compared railway and tramway facilities and traffic, dealt at some length with the question of inland waterways, and concluded with a demand for the recognition of the mutual inter-dependence of the various forms of transport.

Re-introduction of the night service from London to Paris on March 21 *via* the Newhaven-Dieppe route of the Brighton and French State Railways draws attention to the fact that most of the pre-war facilities by this route, including baggage registration, reservation of seats, through bookings, &c., have now been restored. In the few years prior to the war several improvements were made for the benefit of travellers *via* Newhaven and Dieppe. Following the introduction of the turbine steamers *Newhaven* and *Rouen* to the cross-channel fleet came the *Paris*—a smooth-travelling vessel with a twin set of turbine engines, making 24–25 knots an hour—which materially lessened the time taken for the sea crossing. More important than this, however, was the opening of the Pontoise route between Dieppe and Paris on June 25, 1913. By utilising this line the journey between the French coast and capital was reduced to 104 miles, a saving of 20 miles over the Dieppe-Rouen-Paris line, enabling a still further acceleration to be effected in the London and Paris services. A feature of the new Pontoise route is the beautiful scenery through which it passes, made all the more enjoyable by the absence of tunnels. In respect of its scenery the Pontoise portion is in harmony with the rest of the Newhaven-Dieppe route, which, besides being the shortest, is well-known as being the most picturesque route between London and Paris. From Dieppe the line travels through the beautiful orchard-land of Normandy by way of Neufchatel-en-Bray, Forges-les-Eaux, and Pontoise to Paris (Gare St. Lazare).

* * *

By the courtesy of Mr. Mitchell, Managing Director of the Vacuum Brake Company, Limited, Mr. J. W. Dover, of that company, read a paper before the members of the Institution of Locomotive Inspectors and Foremen on the "Vacuum Brake," on February 26. An extremely good discussion followed. A further meeting was held on March 12, when Mr. R. P. C. Sanderson, of the Baldwin Locomotive Works, Philadelphia, invited the members to view a film dealing with the Baldwin Works at the offices of the America Company (London), Limited, Wardour Street, W.; 76 members were present and a very instructive afternoon was spent.

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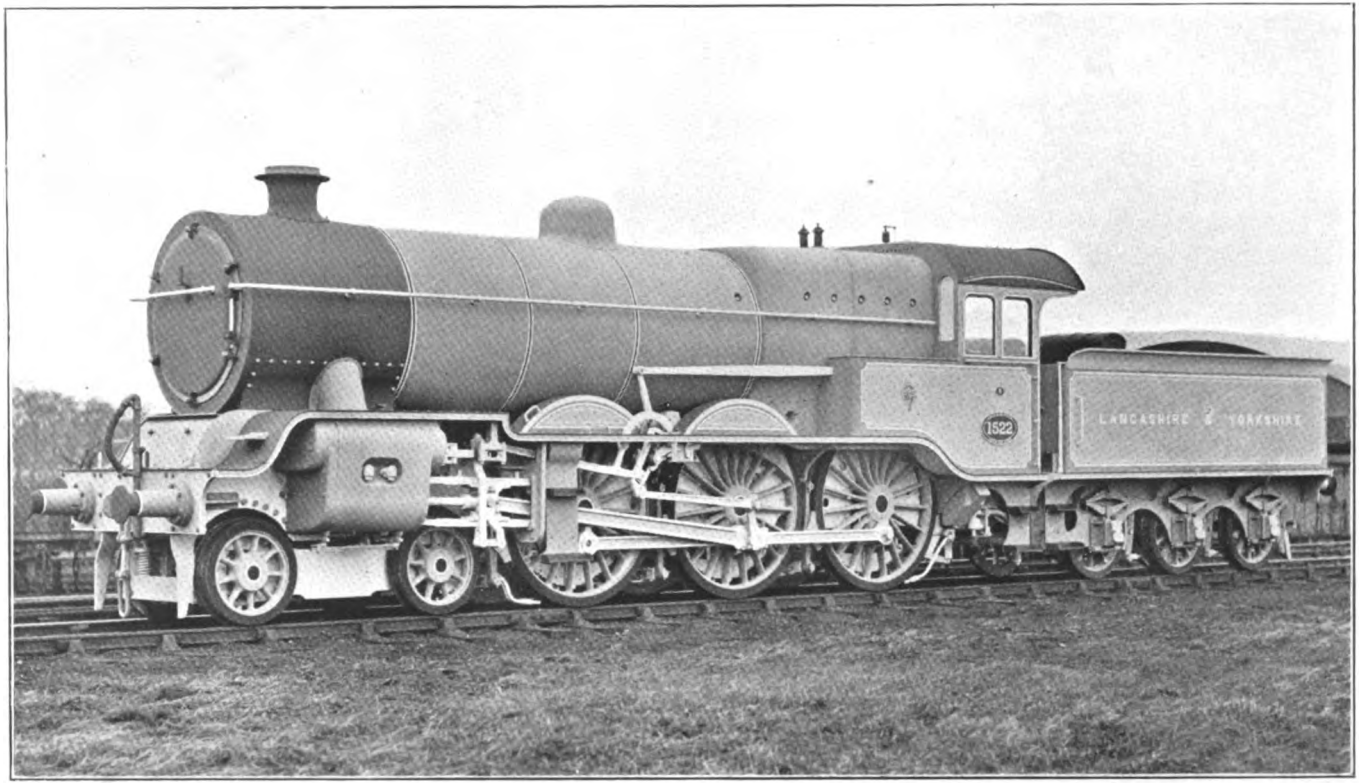

THE RAILWAY MAGAZINE.

REBUILT SUPERHEATER FOUR-CYLINDER 4-6-0 LOCOMOTIVE No. 1522, LANCASHIRE & YORKSHIRE RAILWAY.

Mr. G. HUGHES, C.B.E., Chief Mechanical Engineer.

Cylinders (4), 16½ in. by 26 in. Coupled Wheels, 6 ft. 3 in. diam. Steam Pressure, 180 lbs. per sq. in.
Heating Surface: Tubes, 1,511 sq. ft.; Firebox, 175 sq. ft.; Superheater, 552 sq. ft.; Total, 2,238 sq. ft. Grate Area, 27 sq. ft.
Total Weight in working order: Engine, 79 tons 1 cwt.; Tender, 32 tons 6 cwt.
Fitted with Belpaire Firebox, Walschaert Valve Gear, Horwich Superheater, and Wakefield Mechanical Lubricator.

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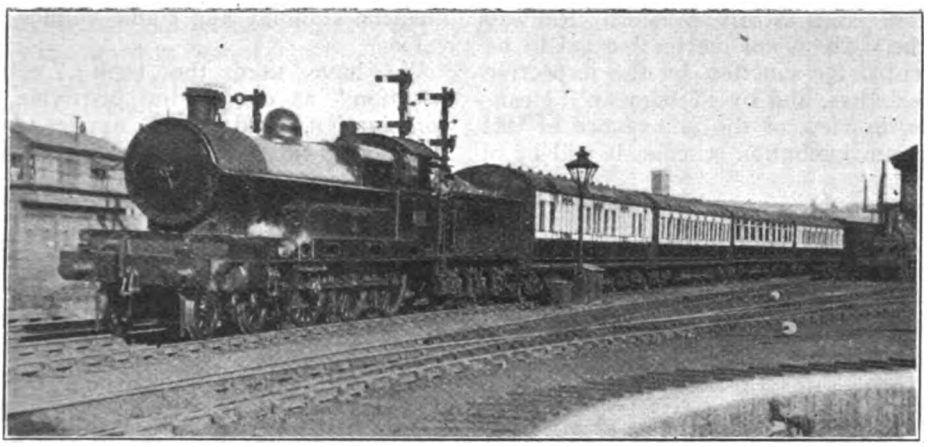

Photo.] **FLEETWOOD-BELFAST BOAT EXPRESS.** [*F. E. Mackay.*

4-6-0 four-cylinder engine No. 1161, "Sir Robert Turnbull."

A Great Railway Combination.

PROPOSED AMALGAMATION OF THE LONDON AND NORTH WESTERN AND LANCASHIRE AND YORKSHIRE RAILWAYS.

ALL the great railways of the United Kingdom have been built up by a process of amalgamation, and in early days relatively large systems were often thus combined with their still greater neighbours. In recent years, however, public opinion, as represented by industry and the legislature, has generally been adverse to such amalgamations, and absorptions such as those of the London, Tilbury and Southend by the Midland, and the Lancashire, Derbyshire and East Coast by the Great Central have been regarded as notable developments.

The Ministry of Transport grouping scheme, and other evidences of the changed ideas of the post-war period, have however prepared the way for large-scale amalgamations, so that the announcement of the proposed combination of the Lancashire and Yorkshire with the London and North Western Railway has caused only a mild degree of surprise and comment, especially as the appointment, as from January 1 last, of Mr. Arthur Watson, C.B.E., as General Manager of both systems, to some extent indicated the trend of affairs. This step is, indeed, the logical outcome of the policy of combination indicated by the Ministry of Transport proposals; but it has to be interpreted on a higher level than that very vague scheme, for it represents the first stage in a process of voluntary amalgamation on the lines of natural selection and commercial suitability.

At the time of writing the long-expected Ministry of Transport Bill, with its promised grouping and other proposals for the future of railways, is expected to be placed before Parliament before this number of the RAILWAY MAGAZINE is published, and it remains to be seen how far the policy of voluntary amalgamation now initiated will accord with that advocated by the Government. Apparently, too, the Lancashire and Yorkshire Railway is to lose its separate entity altogether, by complete absorption. A circular letter has been issued, setting forth the main features of the Provisional Agreement which has been made, and this also indicates the lines upon which the various Lancashire and Yorkshire Railway Stocks are to be exchanged for corresponding

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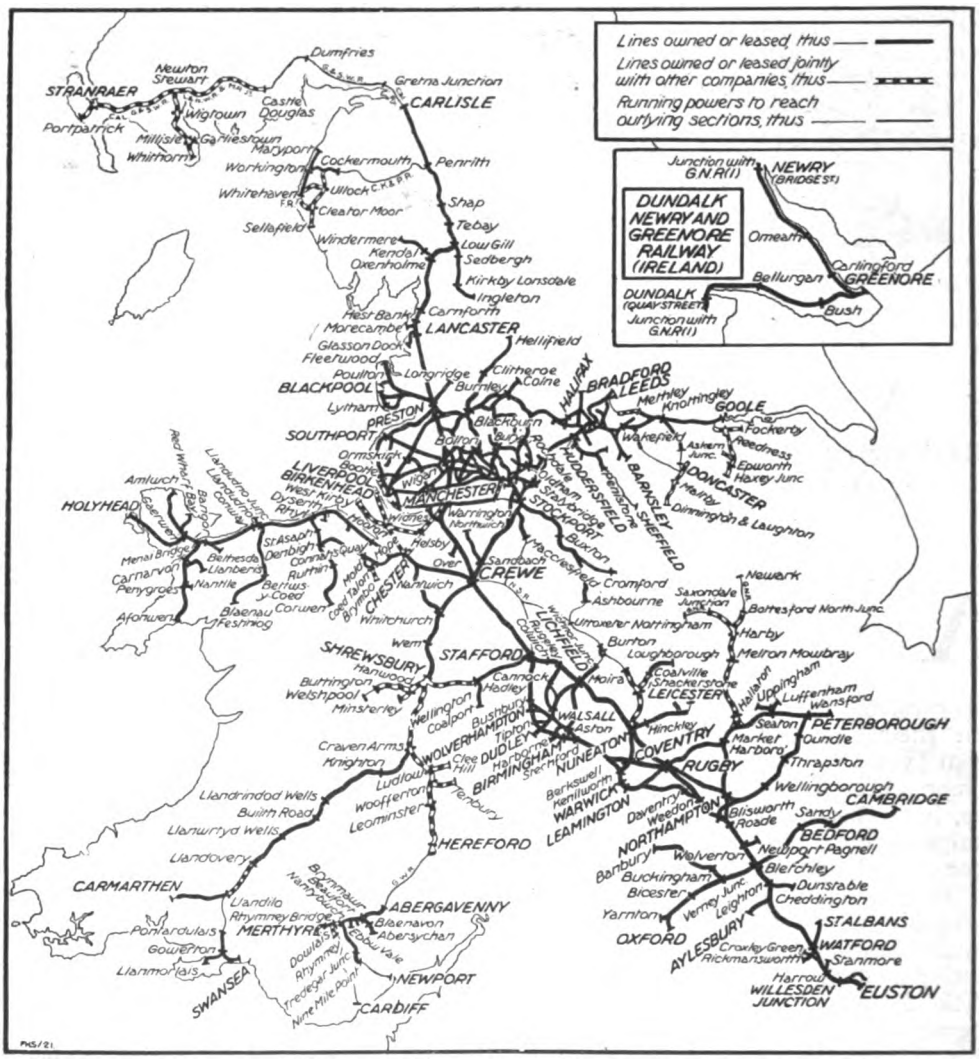
London and North Western Railway Stocks. The whole matter has yet to be presented for sanction by the respective shareholders, and by Parliament. Meanwhile, in view of the importance of this great amalgamation scheme, it will be of interest to consider what it will involve, seeing that two leading companies are concerned, one, we believe, still the "largest joint-stock corporation in the world," the other ranking very highly among British railways in regard to financial standing and traffic volume and value.

We have used the term "natural selection" as one factor justifying the combination, and this applies very pertinently in this instance, seeing that in Lancashire both companies have important interests in common, and throughout their histories they have always been closely associated, and more than once actual proposals for amalgamation have been put forward. Moreover, for many



THE "NEW" LONDON AND NORTH WESTERN RAILWAY.

Map showing combination of London and North Western and Lancashire and Yorkshire Railway Companies' owned, joint and leased or worked lines.

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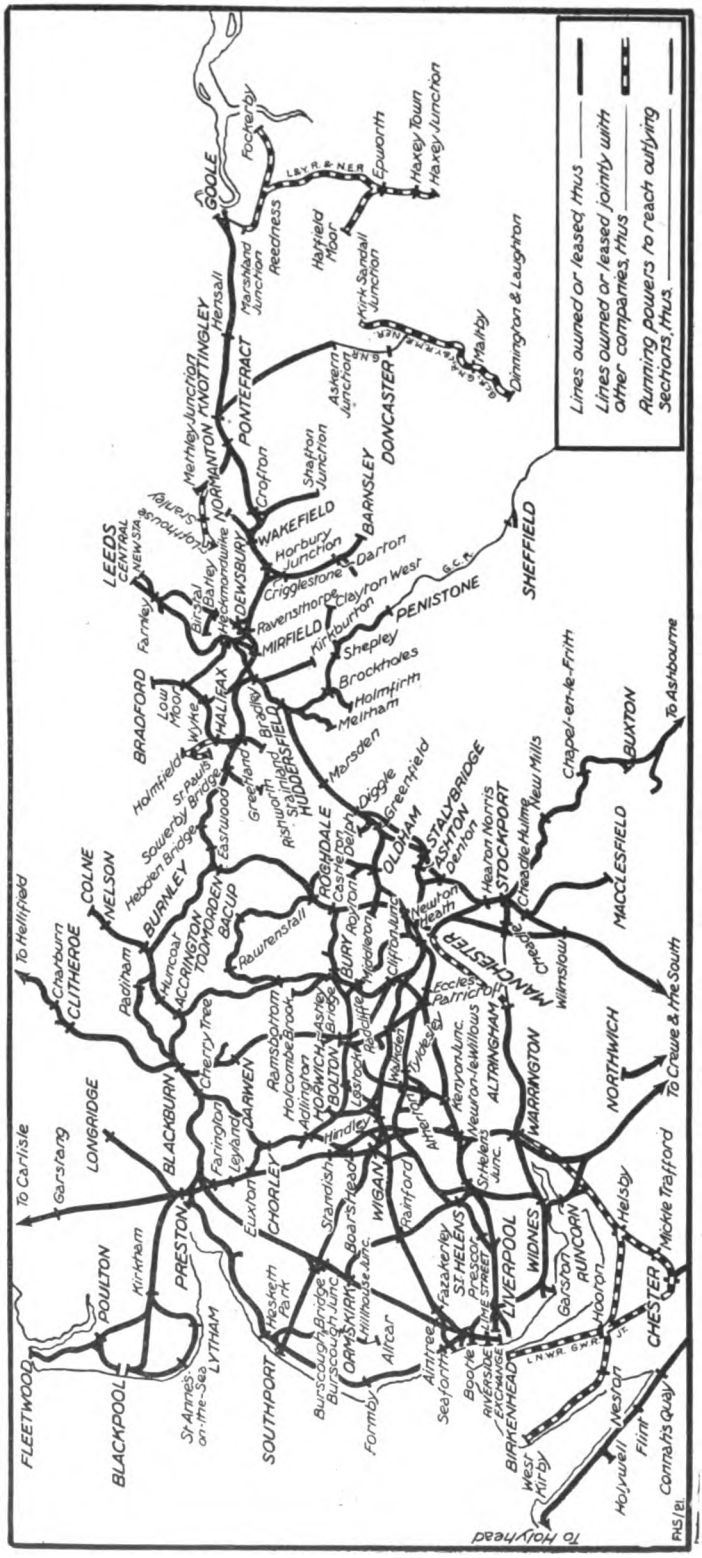
years past, and not only in regard to war-time traffic arrangements, certain train services have been operated as convenient between the two companies, irrespective of the exact details of running power agreements. And in many respects the combination of facilities now to be realised is the logical development of working agreements and the like in force in the pre-war period, when complete amalgamation would have been regarded as a policy of too great a magnitude for serious consideration.

Accompanying this article are two specially-drawn maps. One shows the main features of the complete systems, regarded as one; the other sets forth the complicated Liverpool, Manchester and Leeds area in greater detail. On the same lines it will also be instructive to consider certain statistical and other aspects.

In regard to capital, the London and North Western Railway already headed the list, so that to its own total capital of £127,885,297 is added £72,231,930 from the Lancashire and Yorkshire Railway; the result is a figure representing about one-eighth of the total railway capital of the United Kingdom. Gross receipts and expenditure are also raised in corresponding


Lines owned or leased, thus
Lines owned or leased jointly with other companies, thus
Running powers to reach outlying sections, thus
To Carlisle
To Hellifield
To Crewe & the South
To Ashbourne
To Holyhead
FLEETWOOD
BLACKPOOL
POULTON
LONGRIDGE
PRESTON
BLACKBURN
LYTHAM
SOUTHPORT
CHORLEY
WIGAN
ORMSKIRK
BOLTON
WARRINGTON
LIVERPOOL
CHESTER
BIRKENHEAD
WIDNES
RUNCORN
ALTRINCHAM
MANCHESTER
STOCKPORT
MACCLESFIELD
BUXTON
NORTHWICH
STALYBRIDGE
ASHTON
OLDHAM
ROCHDALE
BURY
BURNLEY
ACCRINGTON
TODMORDEN
BACUP
COLNE
NELSON
CLITHEROE
BRADFORD
HALIFAX
HUDDERSFIELD
LEEDS
DEWSBURY
WAKEFIELD
MIRFIELD
PONTEFRACT
NORMANTON
KNOTTINGLEY
GOOLE
DONCASTER
BARNSLEY
PENISTONE
SHEFFIELD
Epworth
Haxey Town
Haxey Junction
Dinnington & Laughton
Malby
Kirk Sandall Junction
Hatfield Moor
Marshland Junction
Reedness
Fockerby
Hensall
Shaftholme Junction
Askern Junction
Shafton Junction
Crofton
Horbury Junction
Darton
Clayton West
Kirkburton
Shepley
Brockholes
Holmfirth
Meltham
Marsden
Diggle
Greenfield
Mossley
Stalybridge
Hearton Norris
Denton
Newton Heath
Chadderton
Chadderton Hulme
New Mills
Chapel-en-le-Frith
Wilmslow
Eccles
Patricroft
Manchester Junc.
Ardwick
Stockport Junc.
Altrincham Junc.
Warrington Junc.
Newton-le-Willows
St Helens Junc.
St Helens
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Lea Green
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Wigan Junc.
Bolton Junc.
Bury Junc.
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Padiham
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Hebden Bridge
Sowerby Bridge
Sowerby Bridge
Wyke
Low Moor
Holmfield
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Farnley
Birstall
Batley
Heckmondwike
Ravensthorpe
Mirfield
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degree, while on the basis of the 1920 figures, notwithstanding that they are complicated by the conditions of the Government guarantee, the total net incomes of the two companies, £6,863,299 and £2,656,706 respectively, reach the respectable total of £9,526,005. This has, however, to be divided between probably 150,000 shareholders, so that it gave dividends on the respective ordinary stocks of 7½ and 4½ per cent only.

It might be expected that the combination would give the enlarged North Western the premier position in regard to railway route mileage, but even by adding the Lancashire and Yorkshire total of 601 miles to the London and North Western total of 2,066 miles, in both cases including shares of joint and leased or worked lines, the total is still some 300 miles less than that of the Great Western Railway. In so far as multiple-track mileage is indicative of traffic volume and value, however, the situation possesses features of considerable interest. Thus, of the North Western 2.066 route-miles, 1,577 are double track or more, a large proportion for so extensive a system; while in the case of the Lancashire and Yorkshire Railway, no less than 577 miles out of a total of 601 are laid with two or more tracks. And in proportion to total mileage the Lancashire and Yorkshire Railway reaches notable figures, as shown by the following summary:—

	L.N.W.R.	L.Y.R.	Total.
First Track ..	2,066	601	2,667
Second Track ..	1,577	557	2,134
Third Track ..	314	113	427
Fourth Track ..	277	88	365
Over Four Tracks	120	58	178
Total Running lines	4,355	1,417	5,772
Total, including sidings	5,824	2,271	8,095

For its length, at any rate in regard to the greater railways, the Lancashire and Yorkshire reaches very high figures on the basis of receipts per mile, in 1920 no less than £29,000, and for the London and North Western, with its greater proportion of country lines, £19,000. By themselves these figures do not indicate very much, seeing that the construction cost of heavy-traffic lines is usually more or less in proportion, but they are evidence of the traffic importance of the bulk of the Lancashire and Yorkshire system.

Traffic statistics, too, afford much material of interest, as shown by the following summary of goods and passenger traffic during 1920 on each system:—

	L.N.W.R.	L.Y.R.
First Class Passengers	2,000,998	2,660,390
Third Class Passengers	64,007,144	56,057,577
Workmen's Tickets ..	47,865,152	33,689,825
Season Tickets (First class)	12,116	17,149
Season Tickets (Third Class)	75,043	55,669
Tonnage, Merchandise	8,012,709	4,527,012
Tonnage, Coal, Coke, and Patent Fuel ..	17,855,101	8,290,432
Tonnage, other minerals ..	7,862,706	1,926,978
Head of Live Stock ..	1,627,672	406,955

It will be seen that in first-class travel, both ordinary and season-ticket, the Lancashire & Yorkshire actually leads the "premier" line; while in proportion to mileage many other figures reach notable levels.

Traffic mileage also introduces some interesting comparisons:—

	L.N.W.R.	L.Y.R.
Train Miles, Loaded.		
Coaching, steam ..	23,179,137	9,105,634
Coaching, electric ..	978,843	2,060,117
Coaching, rail motor cars..	46,488	413,579
Goods	16,823,098	4,659,624
Shunting miles		
Coaching ..	3,132,553	1,435,033
Goods	13,728,947	8,316,856
Total engine miles ..	168,442,216	30,775,864

In view of the importance and extent of electric traction on the Lancashire and Yorkshire Railway the high mileage totals realised on that line are of interest. For other traffic, however, the average travel is shorter than on the London and North Western Railway, hence the smaller totals under other headings in the case of the Lancashire and Yorkshire Railway, though they are still notable.

Both railways have large numbers of locomotives and vehicles of modern classes, and the following data will therefore be of interest:—

	L.N.W.R.	L.Y.R.
Tender Engines—		
2-4-0	135	1
4-4-0	300	71
4-4-2	—	40
4-6-0	530	20
0-6-0	688	540
0-8-0	482	294
2-8-0	30	—
Total	2,165	966

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	L.N.W.R.	L.Y.R.
Tank Engines—		
0-4-0	17	62
2-4-0	15	1
0-4-2	20	—
0-6-0	293	243
0-6-2	373	22
0-4-4	—	1
2-4-2	248	332
2-6-2	—	18
4-4-0	3	—
4-4-2	50	—
4-6-2	47	—
0-8-2	30	5
	1,096	684

ELECTRIC TRACTION

	L.N.W.R.	L.Y.R.
Motor cars	69	115
Trailer cars	100	118

RAIL MOTOR CARS.

Steam	7	18
Petrol	1	—

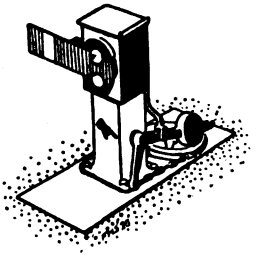
There is no need to consider the rolling-stock in corresponding detail, and it will be sufficient to mention that passenger train vehicles, goods and merchandise vehicles and service vehicles number respectively: London and North Western Railway, 9,550, 76,822 and 7,249; Lancashire and Yorkshire Railway, 4,360, 35,031 and 2,746.

The Lancashire and Yorkshire Railway is the largest owner of steamships among British railway companies, having no fewer than 23 vessels, in the East and West Coast fleets, of 250 tons net or over, though the London and North Western has 14 similar vessels, and one of smaller type. There are also four modern vessels used on the Fleetwood–Belfast route, owned by the two companies jointly, so that the combined fleet numbers 42 vessels. Many other statistical items might be similarly considered, but it will be sufficient to review a few general aspects of the situation which will be created by this great amalgamation.

Between Liverpool, Manchester and Leeds, the two companies have in a sense been competitive; but for some years past working arrangements have neutralised the effects of competition, and it is quite certain that even without amalgamation there would be no revival, so that the passenger tends to gain by the effect of unified action in co-ordinating and improving facilities more than could be gained by competition, even were that principle resuscitated. Similar remarks apply, too, in regard to the alternative routes from Liverpool and Manchester to the North Eastern system, *via* Leeds and *via* Wakefield respectively.

Through coach arrangements between London and Accrington, Blackburn and other Lancashire towns are already divided between the London and North Western and the Midland routes, and it remains to be seen whether these services will witness any change. In several other cases, as on the Anglo-Scottish routes *via* Hellifield, association between the Lancashire and Yorkshire and the Midland and other railways is involved, but obviously all such arrangements will be maintained, or if modified will be considered on the basis of agreement. Indeed, many are already covered by the working arrangements entered into by the three companies in 1909.

In general, however, the Lancashire and Yorkshire and London and North Western Railways are already so closely associated in the busy South Lancashire and South Yorkshire areas, that the net result of combination can only be the general co-ordination and improvement of all facilities afforded. It goes without saying that the co-ordination of staff and material will be of advantage.



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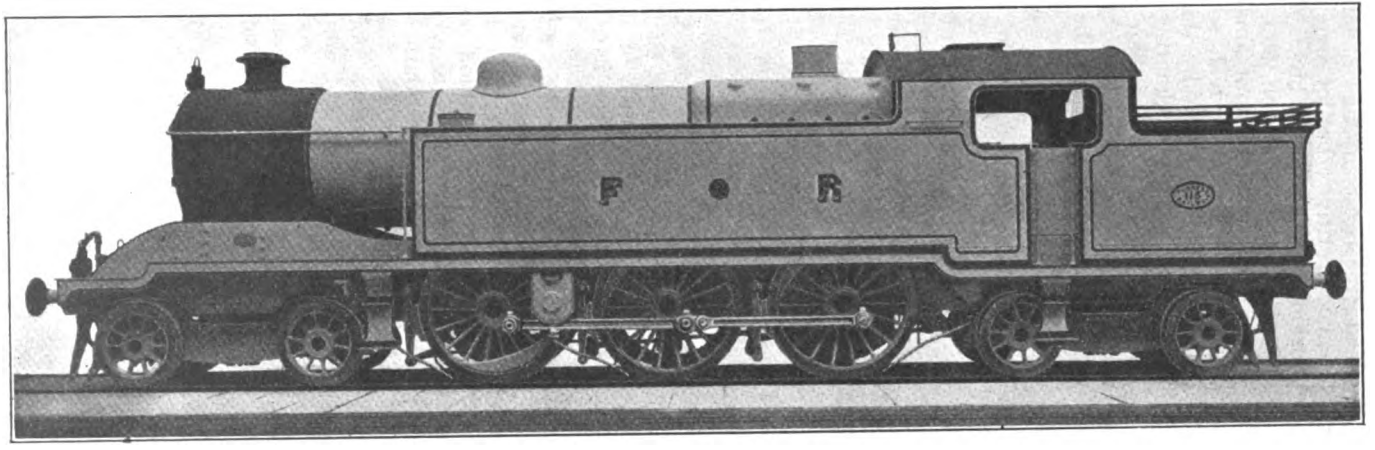
4-6-4 TANK ENGINE, FURNESS RAILWAY.

Mr. D. L. Rutherford, M.Inst.C.E., Engineer and Locomotive Superintendent.



FOR working heavy traffic on the main routes of the Furness Railway, Mr. D. L. Rutherford, Engineer and Locomotive Superintendent, has recently placed in service four powerful 4-6-4 tank engines, one of which is illustrated above. These locomotives have been constructed by Kitson & Co., of Leeds, and are remarkable in that they are the first engines of this type to be built with inside cylinders, while they are not equipped with superheating apparatus.

Designed for general main line traffic the coupled wheels are 5 ft. 8 in. diam., bogie wheels 3 ft. 2 in. diam., coupled wheelbase is 13 ft. 3 in., and the total wheelbase 40 ft. 9 in. The cylinders are 19½ in. by 26 in., with piston valves operated by the ordinary link motion, through rocking levers. The connecting rods drive the leading coupled axle. The firebox is of Belpaire type. Heating surface is made up as follows: tubes, 1,850 sq. ft.; firebox, 153 sq. ft.; total, 2,003 sq. ft. Grate area is 26 sq. ft., and the steam pressure 170 lb. per sq. in. Adhesion weight is 55 tons 8 cwt., and the total weight in working order, 92 tons 15 cwt. The tanks provide capacity for 2,200 gallons of water, while 4 tons of coal can be carried. Fittings include Ross safety valves, Detroit sight-feed lubricators, Gresham and Craven injectors and vacuum brake fittings, and Lambert water-sanding gear.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst. T.

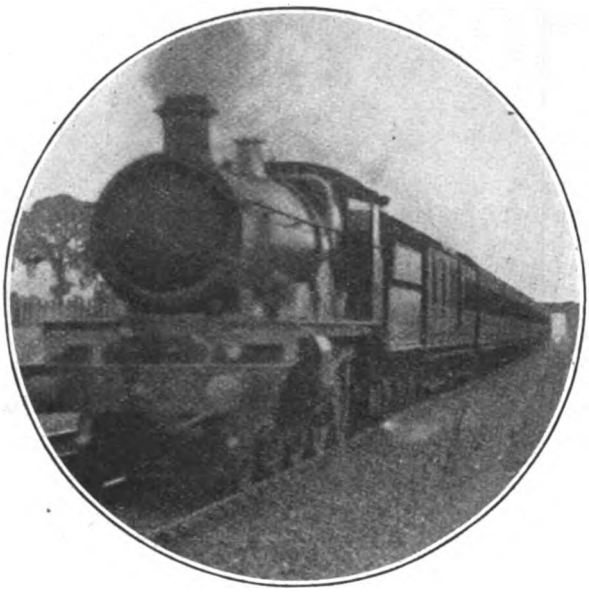

Photo.] [*C. Montague Vesey.*

GREAT WESTERN RAILWAY.

Down express at full speed. Four-cylinder 4–6–0 locomotive, No. 4053, "Princess Alexandra."

UNUSUAL activity at the time of writing in the building of new locomotive types, and the rebuilding of certain of those already existing, calls for some brief mention. Of special note are the new class "N. 2" 0-6-2 superheated suburban tank engines on the Great Northern Railway, of which well over one-half the large order for 60 locomotives is already delivered and at work. I should very much doubt whether so extensive a number of engines of a new design has ever previously been ordered before trial had been made of one or two, or even ten, as "pioneers"; at the same time, it may be considered that the superheating of No. 1598 of the old 0-6-2 series was in the nature of a "trial heat." It is evident from the performance of the new machines, however, that Mr. Gresley has achieved a notable success in this design; the way these engines get away from rest and surmount such inclines as the 1 in 59-60, for example, from Finsbury Park up to Park Junction, beyond Highgate, is indeed remarkable.

On one of the non-stopping trains between Finsbury Park and East Finchley the other evening, with the heaviest of the normal suburban loads—a well-filled Gresley "twin" train of 147 tons tare and at least 180 tons full—we worked up to no less than 30 m.p.h on the grade mentioned, and covered the 3·3 miles, 2·5 of which are at that grade, in 7 min. 15 sec., start-to-stop. Still more recently, with a similar but nearly empty train, we were steadily maintaining 34½ m.p.h. up the 1 in 61 between Totteridge and High Barnet. At a resident at the extremity of the branch in question, I may perhaps be permitted to express the pious hope that such exceptional capabilities as these will not be lost on the time-table authorities at King's Cross. We should, I think, even be prepared to sacrifice some of the "quantity" of the present train service, if we could be offered something a little superior in the way of "quality," both as regards the speed and the systematic arrangement of the trains.

The appearance of the new engines has proved a little deceptive to some lay observers. Wild stories were in circulation when the first of them arrived in the London district as to "six-foot" boilers, the assumption being based on the fact that the chimney is the same height as that

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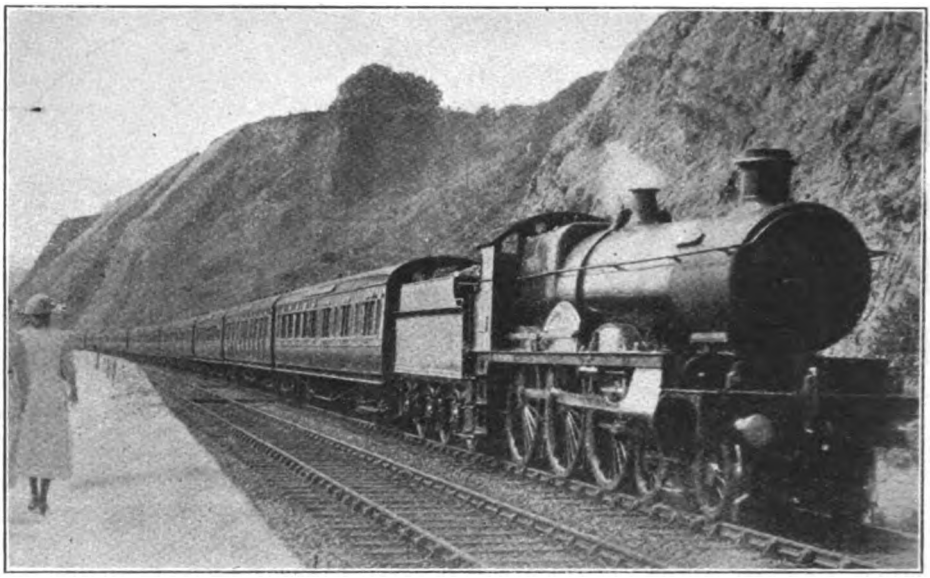

Photo.] GREAT WESTERN RAILWAY. [*J. F. Dearden.*

Up Torquay Restaurant Car Express (non-stop from Newton Abbot) near Parsons Rock Tunnel. Two-cylinder 4-6-0 locomotive, No. 2978, "Kirkland."

on the large-boilered "Mogul," No. 1000. But in point of fact, the new 0-6-2 tanks have boilers of precisely the same diameter as the old 0-6-2 series, viz., 4 ft. 8 in., although the height of the centre line above the rails has certainly been raised from 8 ft. 0½ in. to 8 ft. 9 in.; in length these boilers are actually 6 in. *shorter* than those of their predecessors. It is also probably forgotten by some readers that the boiler mountings of Great Northern engines working through over the Metropolitan widened lines to Moorgate must be cut down in height by 13 in. from normal Great Northern standards in order to pass through the intervening tunnels from King's Cross; this fact combines with the higher pitch of the boiler to give the locomotives a disproportionately massive appearance. As compared with the non-superheated 0-6-2 series, in the new engines the cylinders are increased in diameter from 18 to 19 in., the stroke remaining 26 in; heating surface and grate area are both slightly reduced, while the working pressure is maintained at 170 lb. per sq. in.; the total weight in working order rises from 64¾ to 70¼ tons, but of this increase part is due to the enlarged water capacity of the tanks, which now take 2,000 in place of 1,400 gals. One of the striking features of the new engines is the totally altered character of the exhaust, which enables them to be distinguished easily by the ear alone from every other existing Great Northern locomotive class.

Much fertility is being displayed at present in the design of the tank locomotives, and especially of very large varieties. It turns out to be quite correct, after all, that Mr. Urie has 4-6-2 and 4-8-0 tank locomotives building for the London and South Western Railway, in connection with the Feltham marshalling yard, the former to work between Feltham and Brent sidings on the Midland, and the latter to operate the "humps." Standardisation forms the keynote of these designs, as the 21 in. by 28 in. cylinders and motion of the 4-6-2 engine are identical with those of the latest Urie 4-6-0 5 ft. 7 in. mixed traffic engines, while the 22 in. by 28 in. cylinders of the banking engines conform to those of the "736" series 4-6-0 express engines. An estimated total weight of 96 tons in each case bespeaks two very large and powerful tank types. One of our daily papers, by the way, recently confused these engines with the new corridor trains now under construction for the Bournemouth service, and

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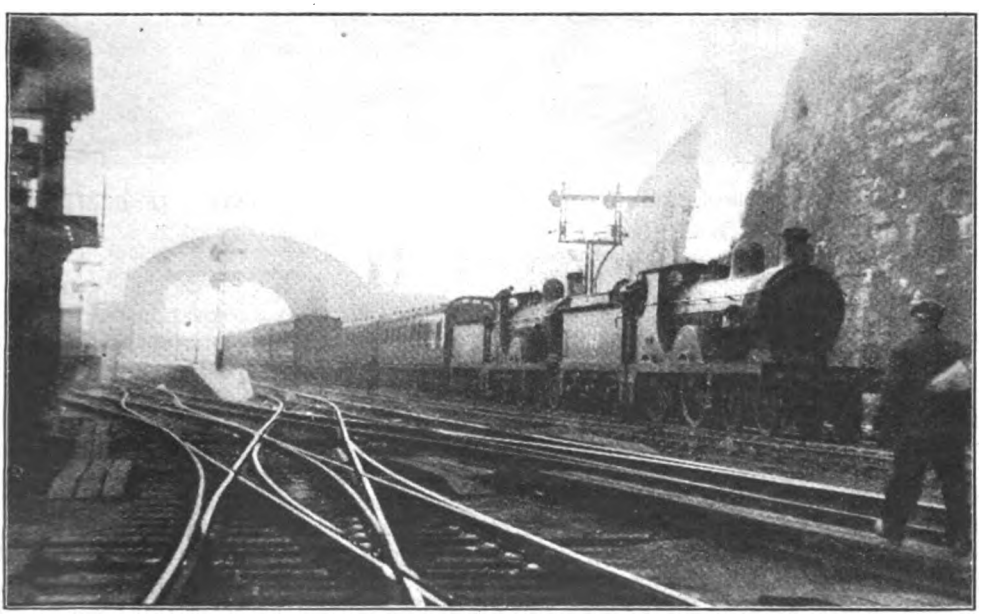
intimated that *express* engines were building at Eastleigh capable of hauling 1,200 ton loads! As such a load would comprise over 40 bogie coaches, it is clear that the value of the coming accelerations would be enhanced to the Bournemouth passenger if he got in at the rear of the train at Waterloo, and walked through to the front end before reaching Bournemouth. I am sure he would thus save quite a quarter of an hour on the journey!

Still larger are the 4-6-4 tank engines on the Furness Railway, concerning which little has yet been published officially, save that they are numbered 115 to 119, have 5 ft. 8 in. wheels, a 5 ft. boiler, affording 2,000 sq. ft. heating surface, and 26 sq. ft. grate area, and 19½ in. by 26 in. cylinders. These remarkably handsome engines are all now in service, and for the present appear to be confined mainly to goods and mineral service, with the exception of certain intermittent trips on slow passenger trains. To me this news comes somewhat as a surprise, as I thought that the 4-6-4 Furness tanks were intended for the long distance main line trains, in the operation of which—during the summer months, at any rate—some increment of tractive power is certainly needed. It is also common knowledge that Mr. R. H. Whitelegg is making use of the experience he gained with the eight "Baltic" tanks he built for the London, Tilbury and Southend Railway (which, at last, by the way, have taken their places in the London suburban service of the Midland Railway between St. Pancras and Luton) to design some similar engines for the coast services of the Glasgow and South Western Railway. Such engines should do well over the heavy grades between Paisley and Greenock.

Another radical departure from existing standards is found in the conversion of Mr. Pickersgill, of the Caledonian Railway, to three-cylinder simple propulsion, the new series of 4-6-0 engines, now under construction at St. Rollox, having this cylinder arrangement. As the driving wheel diameter of these engines is to be only 6 ft. 1 in., and the tenders are of somewhat limited capacity, it may be presumed that they are intended principally for express goods service, but they will be exceptionally powerful locomotives. The three cylinders of 18½ in. diameter by 26 in. stroke are equivalent in tractive capacity to two of 22¾ in.



SOUTH EASTERN AND CHATHAM RAILWAY.
3 p.m. Victoria Train leaving Ramsgate Harbour.

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diameter, and these are to be used in conjunction with a 5 ft. 9 in. boiler affording a total of no less than 2,640 sq. ft. of heating surface, and pressed to 180 lb. per sq. in. The engines alone are estimated to weigh 81 tons in working order, of which 60 tons will be carried on the coupled wheels. On another railway also —the sixth in this country, if the Great Eastern Railway "Decapod" be taken into account—the three-cylinder principle is appearing for the first time, as Mr. Maunsell, of the South Eastern and Chatham Railway is building No. 815, of his 2-6-0 tender series, on these lines.

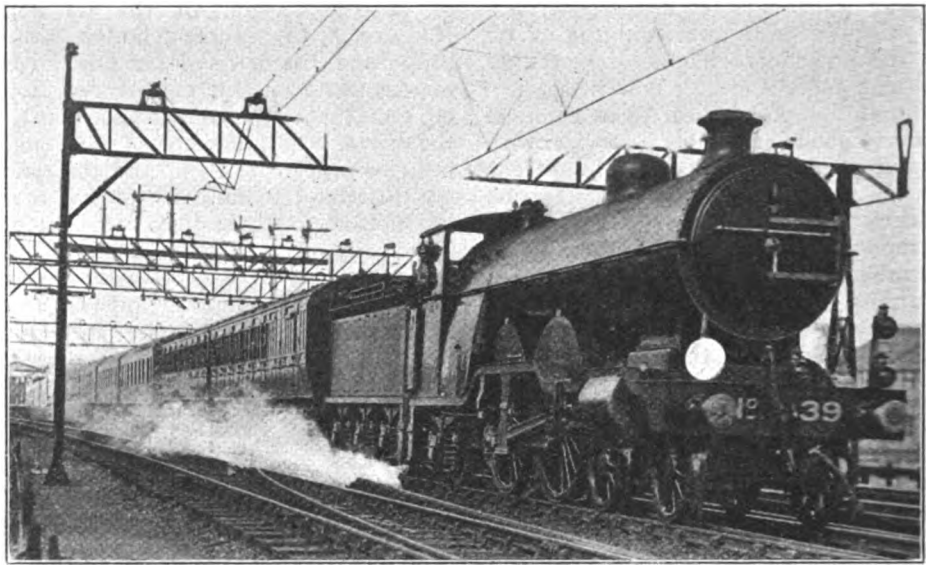

Photo.] **LONDON, BRIGHTON AND SOUTH COAST RAILWAY.** [*F. E. Mackay.*

Down "Southern Belle" Express passing Balham.
4-4-2 locomotive, No. 39, "La France."

In this connection there seems to me to be one advantage resulting from three-cylinder propulsion which is but seldom mentioned. We hear a great deal about the more even turning moment exerted by three cylinders, with the cranks set at 120 deg., than by two cylinders or four, with cranks at 180 and 90 deg. respectively, of the absence of "dead-centre" positions, and so on, but little is said about the evenness of blast which arises out of there being six exhausts instead of four to each revolution of the driving wheels, which must be beneficial in its effect on the fire, expecially at low speeds. One has only to watch the steady column of exhaust steam rising from the chimneys of three-cylinder engines immediately they have got into speed (a feature peculiar to this cylinder arrangement) to realise that the fire must benefit by a correspondingly steady draught.

As regards recent locomotive conversions, by far the most interesting is the rebuilding by Mr. Hughes of his large four-cylinder 4-6-0 engines on the Lancashire and Yorkshire Railway. More than half of these 20 engines have now reappeared from Horwich, fitted with the Horwich superheater, piston valves, outside Walschaert valve-gear instead of the previous inside Joy motion, and large cabs having two side windows. The latter feature, coupled with the raising of the running-plate above the outside piston valves and motion, has considerably modified the external appearance of the engines in question, and has created quite a sensation among the travellers by the residential expresses to and from Blackpool, Southport and Manchester, on which the rebuilt locomotives are mainly employed. In no less a degree has the performance of the engines been revolutionised; in fact, this is, from the performance stand-

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point, one of the most striking examples of the value of superheating (together with the other improvements in the design which have been effected at the same time), that has ever come under my notice. It cannot be denied that the performance of the original engines was generally disappointing, proportionately to their size and power; on the average their work was but little in advance of that of the Aspinall "Atlantics," except on the steepest grades and with the heaviest loads, and they seemed to have a tendency for getting "winded" without much provocation. But the change now is as surprising as it is complete; the engines run with freedom at high speeds on the level, and on the heavily-loaded business services to which I have referred, where time was previously kept with some difficulty, there are now generally several minutes in hand.

In the re-builds the diameter of the four cylinders has been enlarged from 16 to 16½ in.; as regards tractive capacity these are therefore equal to two cylinders 23⅜ in. diam. by 26 in. stroke, and their aggregate volume of 12·88 cubic ft. is in excess of the cylinder volume of any other British express locomotive type. The nearest competitors are the 22 in. by 28 in. cylinders of the Brighton "Baltic" tanks, and of the London and South Western 4-6-0 express engines of the Urie "736" series, with a volume of 12·33 cubic ft. Nominal tractive effort at 85 per cent. working pressure of the rebuilt Lancashire and Yorkshire 4-6-0s is no less than 28,880 lb., or nearly 13 tons. Heating surface of firebox and tubes is reduced by 821 sq. ft., to 1,686 sq. ft., but to this figure must now be added the 552 sq. ft. afforded by the Horwich superheater, making a total of 2,238 sq. ft. Working pressure still remains at 180 lb. per sq. in. The re-building has only involved an increase of 2 tons in the weight of the engine in

LONDON, BRIGHTON AND SOUTH COAST RAILWAY. VICTORIA—BRIGHTON.

Distance.	Engine No. / Type: / Load, tons tare: / Load, tons full:	Schedule.	328 4-6-4 T S 226 240	327 4-6-4 T S 226 240	422 4-4-2 S 227 240	64 4-4-0 228 240	*61 4-4-0 236 285
miles.		min.	m. s.	m. s.	m. s.	m. s.	m. s.
0·0	Victoria .. .. .. dep.	0	0·00	0·00	0·00	0·00	0·00
2·7	Clapham Junction .. .. pass	5	5·55	5·27	5·55	6·20	6·35
4·9	Balham Junction .. .. ,,	9	8·45	8·40*b*	8·50	*f.*	10·00
10·5	East Croydon.. .. .. ,,	15	15·25	15·40	16·03	17·20	18·00
15·0	Coulsdon .. .. .. ,,	21	20·45	20·35	21·25	22·50	24·20
18·9	Quarry Box .. .. .. ,,	26	25·40	27·52*c*	26·22	27·52	30·05
21·9	Earlswood .. .. .. ,,	29	28·55	30·52	29·15	30·55	33·25
26·0	Horley.. .. .. .. ,,	—	32·50	34·28	32·37	34·30	37·30
29·6	Three Bridges .. .. ,,	37	36·25	37·45	35·55	37·50	41·20
31·9	Balcombe Tunnel Box .. ,,	—	39·05	40·05	38·50	40·40	44·15
38·0	Hayward's Heath .. .. ,,	—	44·45	45·28	44·22	47·00	50·20
41·2	Keymer Junction .. .. ,,	49	47·25	48·05	46·58	50·00	53·00
43·8	Hassocks .. .. .. ,,	—	49·55	50·35	49·42	52·35	55·35
46·3	Clayton Summit .. .. ,,	—	*a*	53·10	*e*	*a*	*a*
49·6	Preston Park .. .. ,,	—	58·05	56·25	62·15	60·55	62·10
50·9	Brighton .. .. .. arr.	60	60·25	59·18*d*	61·43	63·25	65·05*d*
50·9	Net time (min.)	60	58	54½	58	60¾	64½

* 11.40 a.m. (65 min.) train. S: Superheater Engine.

Delays:—

a p.w.r. through Clayton Tunnel.
b Signals, Wandsworth Common.
c p.w.r., covered way to Quarry Intermediate Box.
d Signals outside Brighton.
e Signal stop, 15 sec., Hassocks advanced starter, and p.w.r. through Clayton Tunnel.
f p.w.r. Balham Station.

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working order, the total being now a shade over 79 tons

Up till now I have enjoyed only two trips behind the rebuilt engines—I am at present collecting a series of logs on the Blackpool and Southport services for tabulation later on in the year—but those trips embodied some startling features. It is well-known that for years past a time-honoured competition in speed has taken place between two afternoon expresses from York out as far as Church Fenton; before the war the two trains were the 2.35 p.m. North Eastern express to Leeds, and the 2.36 p.m. Lancashire and Yorkshire express to Manchester, and since the war the authorities have again encouraged the contest, though doubtless unconsciously, by starting the rivals both at 2.45 p.m. Hitherto, it must be confessed that the North Eastern has generally had the best of it, especially when a "Z" class three-cylinder "Atlantic" has been used, but the appearance of the rebuilt Lancashire and Yorkshire 4-6-0's on the scene has modified things considerably.

I was a passenger on the Lancashire and Yorkshire express the other afternoon, when No. 1523 of the new type driven by Shorrock, of Agecroft shed, was at the head of a five-coach featherweight train of 130 tons. We started from the south end of the station at precisely the same moment as the Leeds train got away from the north end, and ran smartly enough down to Chaloner Whin Junction, passed in 3¾ min., after which Driver Shorrock (somewhat unaccountably to me, as I did not know what was afoot), eased his engine, and we ran on through Copmanthorpe at about 58 m.p.h. Immediately afterwards, up came superheated North Eastern "R" class 4-4-0, No. 711, going evidently "all out" at a little over 60 m.p.h., with a train heavier than ours by three six-wheelers, and an exceedingly satisfied smile playing around the features of driver and fireman at so easily being able to overhaul the other competitor. Our driver—with his tongue in his cheek, I fear—allowed the "Geordie" just to get ahead of him, and then, without shifting his reversing gear, he merely opened his regulator to about the three-quarter position. The response of the engine was electrifying; we positively bounded forward and in less than a mile of level track had worked up from 58 to

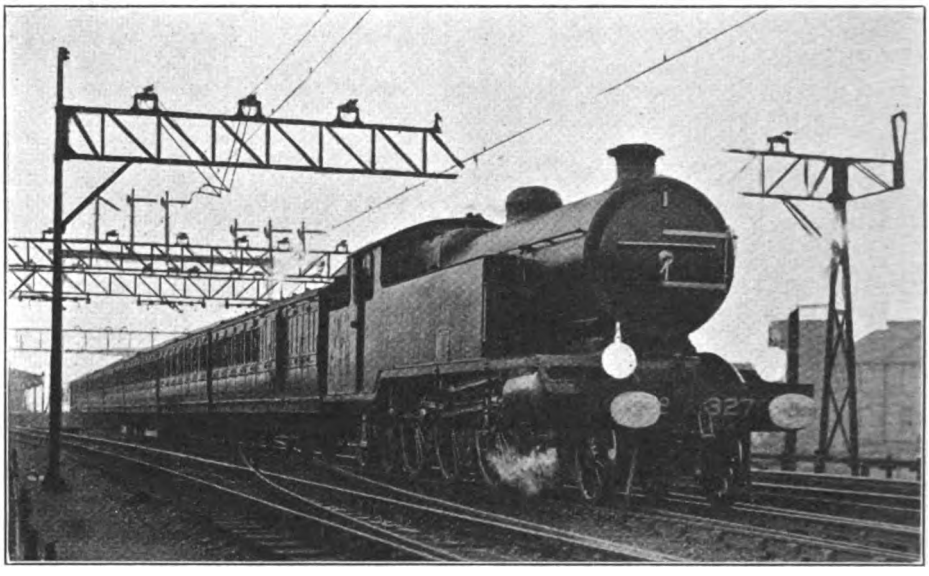

Photo.] LONDON, BRIGHTON AND SOUTH COAST RAILWAY. [*F. E. Mackay.*

10.40 a.m. Victoria-Brighton Express passing Balham.
4-6-4 superheater tank engine, No. 327, "Charles C. Macrae."

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69 m.p.h., incidentally leaving our rivals "standing" and seeing no more of them that afternoon. The changed expression on the faces of the North Eastern crew as we passed was a study!

Unfortunately we were so well on time that little further of note could be attempted. But after Sowerby Bridge we did accelerate up a grade mostly at 1 in 300 or a little flatter to 58·4 m.p.h., in 4 miles' run, and maintained the latter speed up the succeeding 1 in 183 until we were stopped by signal at Hall Royd Junction, and also beyond Newton Heath, we still managed to keep the schedule of 27 min. for the 19·3 miles from Todmorden to Manchester.

Again, on the 5 p.m. non-stop express from Manchester to Southport, Driver Rigby, of Southport shed, got some equally fine work out of No. 1510 with an eleven-coach "fireproof" corridor train weighing 299 tons empty, and 325 tons with the usual crowded passenger complement. We fairly "sailed" up Pendlebury bank, passing Pendleton, 2·3 miles, in 5 min.

LONDON, BRIGHTON AND SOUTH COAST RAILWAY. BRIGHTON—VICTORIA.

Distance.	Engine No.: / Type: / Load, tons tare: / Load, tons full:	Schedule.	328 / 4-6-4 T S / 226 / 240	425 / 4-4-2 S / 226 / 240	425 / 4-4-2 S / 226 / 240	41 / 4-4-2 / 226 / 240
miles		min.	m. s.	m. s.	m. s.	m. s.
0·0	Brighton .. .. .. dep.	0	0·00	0·00	0·00	0·00
1·3	Preston Park .. .. pass	—	3·35	3·35	3·35	3·30
4·6	Clayton Summit .. .. ,,	—	8·15	8·05	8·10	8·20
9·7	Keymer Junction .. .. ,,	13	12·45	13·25	12·58	13·10
12·9	Hayward's Heath .. .. ,,	—	15·25	16·30	15·45	15·50
19·0	Balcombe Tunnel Box .. ,,	—	21·10	23·10	22·25	21·50
21·3	Three Bridges .. .. ,,	25	23·20	25·30	24·45	24·07
24·9	Horley.. .. .. .. ,,	—	26·05	28·25	27·47	27·17
29·0	Earlswood .. .. .. ,,	—	29·50	32·10	31·35	31·20
32·0	Quarry Box .. .. .. ,,	36	33·20	36·55*a*	34·55	34·48
35·9	Coulsdon .. .. .. ,,	—	37·40	41·50	39·50*c*	39·10
40·4	East Croydon.. .. .. ,,	45	41·45	47·00*b*	44·35*d*	43·45
46·0	Balham Junction .. .. ,,	52	49·10	53·40	52·10	52·40*e*
48·2	Clapham Junction .. .. ,,	55	51·55	56·17	54·43	55·15
50·9	Victoria .. .. .. arr.	60	58·25	61·08	59·25	60·10
50·9	Net times (min.)	60	55½*	58	57½	57

**Possible* time, with normal running from Croydon. S: Superheater Engine.

Delays.—

a p.w.r., Redstone Tunnel.
b slight signals, Coulsdon to South Croydon.
c p.w.r., Quarry Intermediate.
d Signals, South Croydon.
e Signals, Norbury, walking pace.

Junction; in fact, the average speed from Mytholmroyd up to Eastwood was 56 m.p.h. From Todmorden, too, we achieved an extraordinary feat by accelerating from the dead start up a 1 in 183 grade to 47½ m.p.h. at Walsden, in a distance of only 1·3 miles, which occupied 2 min. 35 sec. Notwithstanding severe checks at the west end of Summit Tunnel and at Littleborough, on passing to and from the goods reception line (owing to relaying in progress on the main line), and further bad signal checks twice near Middleton 5 sec., at 43 m.p.h.; Swinton, 5·1 miles, in 9 min. 55 sec. (30 m.p.h. was the maintained speed on the 1 in 94); Atherton, 11 miles, in 16¾ min., after touching 67 m.p.h. on the previous dip; Dobb's Brow Junction, 13·5 miles, in 19 min. 20 sec.; and Crow Nest Junction, 14·8 miles, in 20½ min. From here we went most cautiously down to Wigan, which was passed at 25 m.p.h. in 25¾ min. from the start (17·9 miles); the ensuing 4·5 miles of sharply undulating and mainly adverse grades to Appley Bridge occupied

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6 min. 5 sec., while from there the 8·7 favourable miles on to Bescar Lane were covered in 8 min. 5 sec., with a top speed of 69 m.p.h. Then we eased considerably, so that the last 3·4 miles into St. Luke's occupied 4 min. 20 sec. But we had completed the 34·3 miles from Manchester in 44¼ min., that is, in the original time of 1910, long before the existence of loads such as this, and in 2¾ min. less than the present time. When last I made this journey, with No. 1525, before rebuilding, and one coach *less*, the journey took us 49¼ min., and at least 47¾ min. net; this run, with others, was dealt with in my article of February last. By way of contrast, the speed at Hoscar was only 62½ m.p.h., against No. 1510's 69 m.p.h.—a fair criterion of the astonishing change that Mr. Hughes has wrought in the work of these engines by rebuilding and superheating.

From this northerly region I pass on to the London, Brighton and South Coast Railway, in order that I may describe a series of runs on the restored pre-war 60-min. schedules of the principal expresses between London and Brighton. Sir William Forbes, the General Manager of the line, has kindly afforded me facilities for making a couple of journeys on the "Southern Belle" myself, and Mr. L. B. Billinton, the Locomotive Superintendent has been good enough to arrange that No. 328—one of his two magnificent 4-6-4 express superheater tank engines—should work on both the trains by which I travelled, as I had not previously had an opportunity of recording their work. These two runs are the first in each case of those shown in the two annexed tables, and for the remainder I am indebted to two friends, one now returned to railway service in the Far East after a recent furlough, and the other a Brighton resident.

Before describing the runs, I will briefly recapitulate the gradients. Out of Victoria the line rises for half-a-mile at 1 in 64 to the Grosvenor Bridge, and then undulates sharply to Clapham Junction, after which there is a rising gradient of 1 in 166 to Balham Junction, steepening in the last half-mile to 1 in 94. An undulating stretch to Streatham Common is succeeded by a rise at 1 in 126-264-100 to the flying junction at Windmill Bridge, Croydon, where the London Bridge line (by which all the subsequent mile-posts, 0·3-mile less than from Victoria, are measured) is joined. From East Croydon to Coulsdon there is a steady rise at 1 in 264, followed by half-a-mile up at 1 in 100 through the covered way, then a

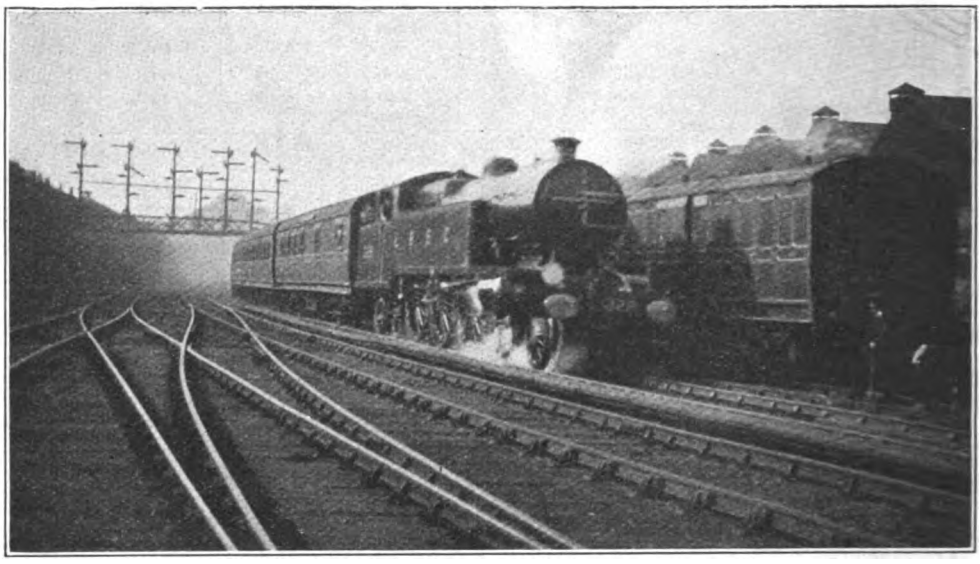

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*A. B. MacLeod.*

Express to Victoria leaving Brighton Central. 4-6-4 tank engine, No. 328.

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slightly easier stretch, and a final 1½ miles at 1 in 165 to Quarry Summit, at the north end of Quarry Tunnel. From there ensues a drop at 1 in 206-230-200-163 to Earlswood, followed by a further 1 in 264 descent to Horley—8 miles in all—with a subsequent 6½ miles' rise mostly at 1 in 264, to Balcombe Summit, near the north end of Balcombe Tunnel (mile-post 31¾). There is then an 8 mile fall to Keymer Junction, mostly at 1 in 264, and a last 6 miles' ascent (4 miles at 1 in 264) leads to the south end of Clayton Tunnel (mile-post 46). A final 4¼ miles down at 1 in 264 brings us practically into Brighton. Of the two directions, the down journey always appeals to me as the harder, as Brighton terminus is at a higher altitude than Victoria, and the engines of down expresses have to start cold up an incline of 1 in 64, which forms the commencement of some 18 miles of practically unbroken ascent, including 2½ miles at 1 in 94-126, 3 at 1 in 165-200, and 6¼ at 1 in 264. As a set-off to this, the engines of up expresses cannot make full use of the falling grades below Croydon, on account of the numerous junctions and curves, but the handicap in this direction is not so severe, as drivers have generally some time in hand before passing Croydon.

On the down journey 5 min. to Clapham Junction is distinctly a "counsel of perfection" allowance, as is also 6 min. for the 5·6 miles from Balham to Croydon, whereas the intervening 4 min. schedule for 2·2 miles only from Clapham to Balham is a full minute in excess of requirements. Streeter was the driver of No. 328 on my journey on the 11 a.m. down "Belle," and we passed Clapham Junction at 48½ m.p.h., only falling to 45 at Balham—good work this, up 1 in 166 and 94—after which we touched 55½ m.p.h. at Streatham. Minimum rate up the 1 in 264-100 past Selhurst was 49½ m.p.h., and we were ½-min. behind time at Croydon. The long subsequent 1 in 264 brought us down merely from 52½ to 50 m.p.h., but on the 1 in 165 to Quarry Summit we fell to 44; between Croydon and Quarry, however, we gained ¾-min. Down to Earlswood we went very easily, not exceeding 62½ m.p.h., but we did get up to 67 at Horley; then, after a minimum of 53 at Balcombe Tunnel, we worked up to a sustained 74 past Hayward's Heath, so gaining exactly 2 min. from Croydon to Keymer. But the gain was not sufficient to compensate for the very severe p.w.r. slack through the whole length of Clayton Tunnel, and our arrival at Brighton was therefore 25 sec. behind time. Net time was 58 min.

A much finer run was that in the next column behind No. 327, *Charles C. Macrae.* On this journey the speed at Clapham was as much as 60 m.p.h., and the time only 27 sec. in excess of the impossible booking, but a serious signal check at Wandsworth Common brought the speed down to 20 m.p.h.; from this, however, the big engine made a remarkable recovery, as the speed from Norbury to Croydon, including 1¾ miles up at 1 in 264-100, averaged 54 m.p.h., and East Croydon was passed only ¾-min. behind time. Speed was steadily maintained at 55 m.p.h. up the subsequent 1 in 264, until steam was shut off for the long p.w.r. check from Coulsdon covered way to Quarry Intermediate signal-box. It is fair to assume that the delays to Quarry had cost not less than 4¼ min., and yet that box was passed barely 2 min. behind time. Smart running was made from Quarry to Earlswood, and at Horley speed rose to 69 m.p.h., while at Balcombe Tunnel the rate was as high as 58½ m.p.h. Touching 75 m.p.h. beyond Hayward's Heath, No. 327 went up to Clayton at a minimum of 56, and despite further delays by signal outside Brighton, the stop was effected in 59 min. 18 sec. from Victoria, all delays included, or 54¼ min. net. It is worthy of note that on this fine run the 30·7 miles from Quarry to Preston Park were reeled off in 28 min. 33 sec., at an average of 64·5 m.p.h., although they include 12½ uphill miles, of which 8¼ are at 1 in 264.

The third trip had few features of note in its early stages; the minimum speed at Quarry was as low as 42½ m.p.h., but then there was some very fast running later, with a maximum of 75½ m.p.h. at Horley, and another of 75 at Hayward's Heath; the intervening minimum at Balcombe was 52 m.p.h. So the 24·9 miles from Quarry to Hassocks were run in 23 min. 20 sec.; then adverse signals at the latter station brought the train to a dead stand for 15 sec. at the advanced starter, after which there came again the long slowing

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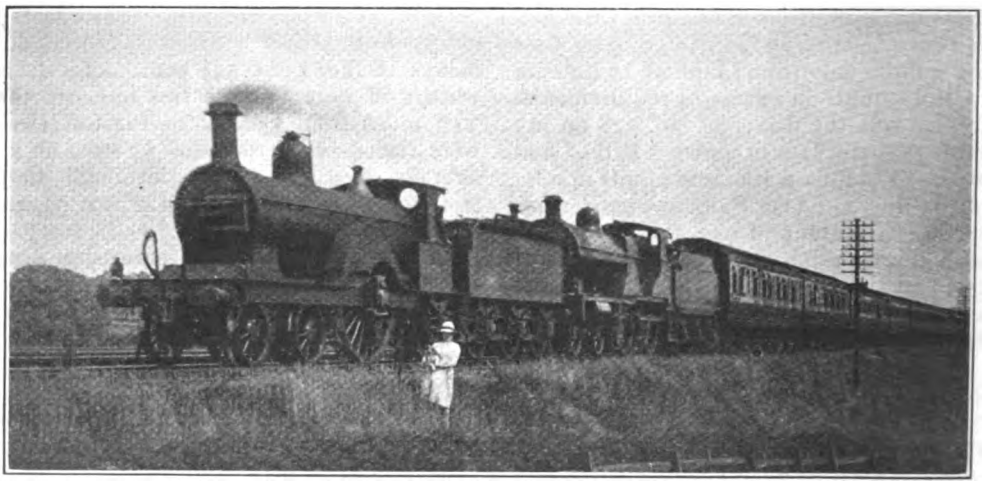
through Clayton Tunnel. Otherwise, there would have been a gain of 2 min.

On the fourth trip, No. 64 was really the engine detailed for the 2 p.m. down "semi-fast," but had had injector trouble, with the result that the engine for the 3.10 had to work the former train; an hour later, however, the trouble was rectified, and No. 64 therefore essayed the "Belle." The actual start was excellent, Grosvenor Road Box being passed in exactly 2½ min., but the Balham slack was an unfortunate handicap. Up the 1 in 264 from Croydon the speed was maintained steadily at 49 m.p.h., rising finally to 50 at Coulsdon; my friend does not give the minimum to Quarry, which was passed less than 2 min. late. Neither does he mention the maximum at Horley, which from the times, would appear to have been about 69 m.p.h.; the lowest rate at Balcombe was 46 m.p.h. The speed on the descent to Keymer was adversely affected by the driver shutting off steam at Hayward's Heath, and in conclusion there came the Clayton Tunnel slack, so that 3½ min. were lost to Brighton. But net time was only 60¾ min., and schedule was improved on by 80 sec. between Croydon and Keymer.

The run in the last column is the one I had on the 11.40 a.m. down—a 65 min. train—last summer, and described in the November issue of last year. On this occasion the tare load was little heavier than on the runs preceding, but as it consisted of 11 bogies of light stock packed with some 720 passengers, the gross load was fully 285 tons. The running was considerably slower to Quarry than on the preceding trips, but from there we maintained the "Belle" timing to Keymer, touching 65 m.p.h. at Horley and 72½ at Hayward's Heath, with minima of 47½ at Balcombe and 48 at the south end of Clayton Tunnel. Load considered, therefore, this was not at all a bad run.

Of all the trips, however, it was my own up journey behind No. 328, driven in this direction by Green, that carries off the honours. We started moderately to Preston Park, which was passed at a shade under 40 m.p.h., but up the 1 in 264 from there to Clayton we worked up to 48½ m.p.h. Keymer was passed at a sustained 75 m.p.h., and then we went splendidly up the 8 miles of Balcombe bank, nearly all at 1 in 264, with no lower rate than 58½ m.p.h. On Three Bridges bank the still higher rate of 77½ m.p.h. was reached (my own record, so far as the Brighton line is concerned), but shortly after passing Horley the engine was eased, and at Quarry we fell to 45 m.p.h. But for this, we should certainly have got through Croydon in "even time"; as it was,



MIDLAND RAILWAY.

St. Pancras-Leeds Express near Leicester.
Train engine, 4-4-0 Compound No. 1020, piloted by 4-2-2 engine No. 656.

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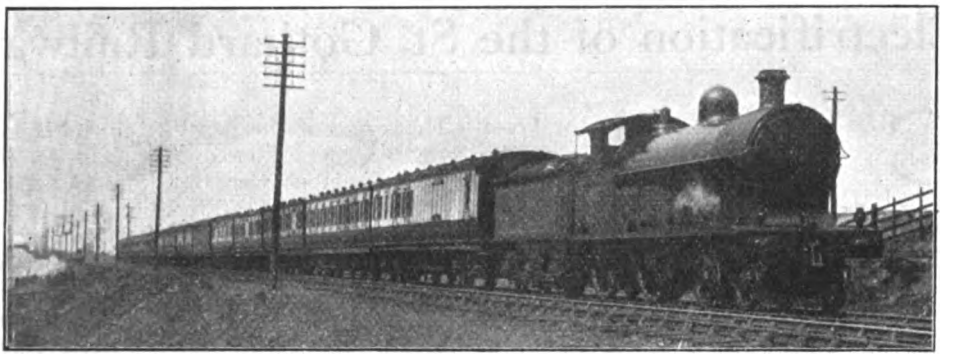


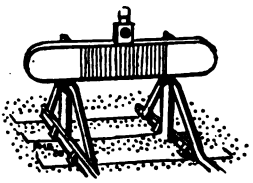
Photo.] LONDON AND NORTH WESTERN RAILWAY. [*G. W. Smith.*

Liverpool-Leeds Express running over Lancashire & Yorkshire Railway near Clayton Bridge.
4-4-0 engine, No. 845, "Saddleback."

we nearly did so by covering the 29 miles to Earlswood in 29 min. 50 sec. From Hassocks to Earlswood we covered 21·9 miles in exactly 19¼ min., at an average of 68·3 m.p.h., despite the fact that 12 miles, or 55 per cent. of this distance, are on rising grades, and of these 10¾ are inclined at 1 in 264—a notable tribute to the tractive power of the locomotive. We did not exceed 67 m.p.h. past Purley, and travelled at a super-cautious rate from Croydon onwards; otherwise we might easily have been in at least 5 min. before time.

The second was a good average trip; the start was brisk, but the pace past Keymer was very leisurely, speed not exceeding 64½ m.p.h. Following a minimum of 54 m.p.h. on Balcombe bank, however, No. 425 reached 73½ m.p.h. at Horley. After the Redstone Tunnel check, there was an acceleration up Quarry bank to 46½ m.p.h., and subsequent checks, though brisk running was made from Croydon, prevented an absolutely punctual arrival. On the next trip, with the same engine and load, an equally fine start was followed by better use of the falling grades. Clayton Tunnel was entered at 48 m.p.h., and the minimum at Balcombe was the same; the maximum at Keymer does not appear in the record, but at Horley it was a sustained 71½ m.p.h. At Quarry speed had fallen to 43 m.p.h., the driver now having time well in hand, and despite subsequent checks an arrival ½-min. before time was effected.

The last run was made behind one of the non-superheated "Atlantics" of the earlier batch, and was a sterling effort. A rate of 46 m.p.h. was attained before entering Clayton Tunnel, and the maximum at Keymer was 71½ m.p.h. After a minimum as high as 55 m.p.h. at Balcombe, the engine was eased slightly, and the highest rate at Horley was only 67½ m.p.h. At Quarry the lowest speed was 47 m.p.h., and even an all but dead stop for signals at Norbury did not prevent a punctual arrival at Victoria. It is a real pleasure to me to be able to record such noteworthy post-war locomotive performance as that embodied in these runs—equal to the best pre-war achievements of most of the leading lines and vastly better than the bulk of their present efforts; it is to be hoped that the coming general British accelerations will offer the recorder running of comparable interest in other directions.



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Electrification of the St. Gothard Railway.

COMPLETED in 1882, at a total cost of more than £10,000,000, the St. Gothard Railway, connecting Lucerne with Chiasso, on the Swiss Italian frontier, since 1909 operated as part of the Swiss Federal Railways, constitutes one of the principal international lines. The highest altitude reached is 3,786 ft. above sea level, and in its length of 139½ miles there are no fewer than 80 tunnels, aggregating about 30 miles, and 324 bridges of more than 32 ft. span. Gradients are generally very severe, and although located in a country where water power is available for electric current supply, electrification involves many difficult problems.

The whole line ought, however, to have been electrified by now, but owing to the war this was impossible, not only because of the difficulty of obtaining the necessary materials, especially copper wire, which comes chiefly from the United States, but also because labour could not be had. As is well known, all Swiss tunnels, and, for that matter, Swiss railways generally, have been constructed by Italian labour, and when war broke out all these Italian tunnel and railway workers left for Italy. Swiss labourers who might have taken their places were mobilised, hence the construction of power stations and much other work had to cease.

Yet never before was electrification so urgently needed. The difficulty of procuring coal and its dearness are perhaps worse felt in Switzerland than anywhere else, and during the last year or two coal has even had to be imported from the United States, at a price sometimes as high as 150 fr. a ton at the pit mouth. In 1919, in fact, 69,000,000 fr. of the Swiss Federal Railways' total expenditure of 290,892,080 fr. was for coal only, and this with greatly reduced train services and a total railway traffic no greater than that of 1909. In other words, the war has put back Swiss railway traffic 10 years.

Cost of electrification is naturally enormously heavier than was estimated before the war. An electric locomotive now costs more than twice as much as in 1913. Thus, one of the new St. Gothard goods engines costs 1,000,000 fr. (say £40.000). These engines were built in Switzerland (at Oerlikon and Winterthur), and, in 1918, the Swiss Federal Railways ordered 10 for the St. Gothard line. Twenty-three more such engines have since been ordered designed for hauling a train weighing 860 tons between Goldau and Chiasso (122 miles) and back in 28 hours, stopping one-quarter of an hour at each place. Maximum speed is about 40 miles an hour. The engines weigh 128 tons, and their length is a little more than 63 ft.

Express and slow passenger trains are to be hauled by another type of electric engine, with a maximum speed of 47 miles an hour, also built in Winterthur by the Swiss Engine and Machinery Works, and the electric part by the Anglo-Swiss firm of Brown, Boveri and Co., of Baden, Switzerland. These engines are intended to make the journey between Lucerne and Chiasso (139½ miles) thrice in 24 hours, with a stoppage of a quarter of an hour at each terminal station, and to haul a load of 425 tons. They are equipped with Westinghouse or air-compressor double brakes, a hand brake, an air compressor signal whistle, a sand strewer, &c. Current, as collected, is conveyed to a transformer, which reduces the pressure to 585 volts, and supplies the current to the driving motors.

At present only the great St. Gothard tunnel, 9 miles in length, is actually operated electrically. The first passenger train was run on September 15 last, and took 13 minutes to run through it. But except in the tunnel and between Immensee and Brunnen there is not yet much sign of electrification. On this particular stretch the poles for the overhead wires are up; otherwise after Brunnen as far as Erstfeld no one, at any rate no one not an electrician, can see any sign of electrification. At Erstfeld, however, everything is ready. When the whole line is entirely run by electricity, the pressure may reach 15,000 volts, but so long as any steam locomotives are used, as is still the case, soot and steam very much reduce the effect

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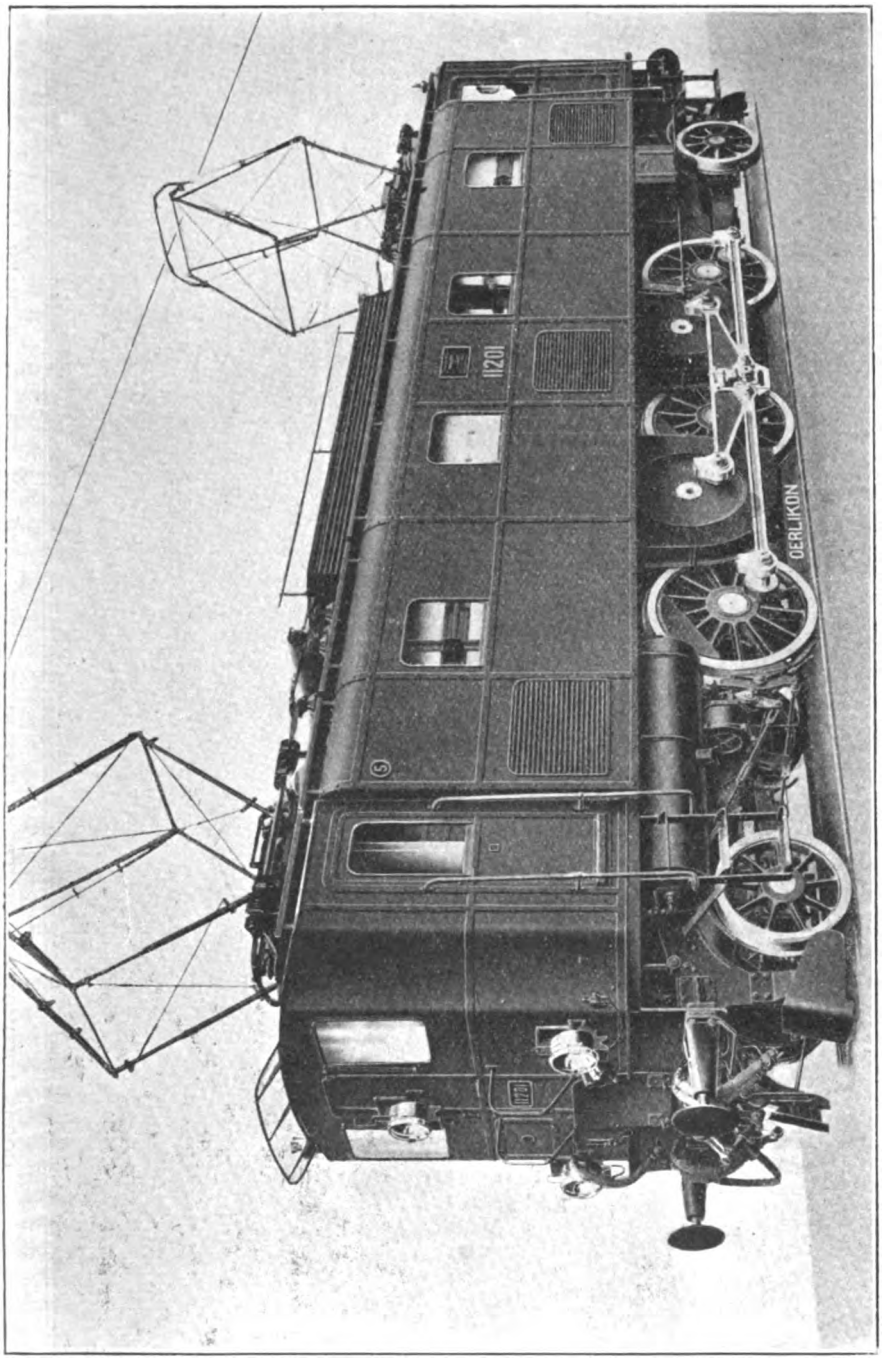

TYPICAL PASSENGER LOCOMOTIVE USED ON THE ST. GOTHARD LINE

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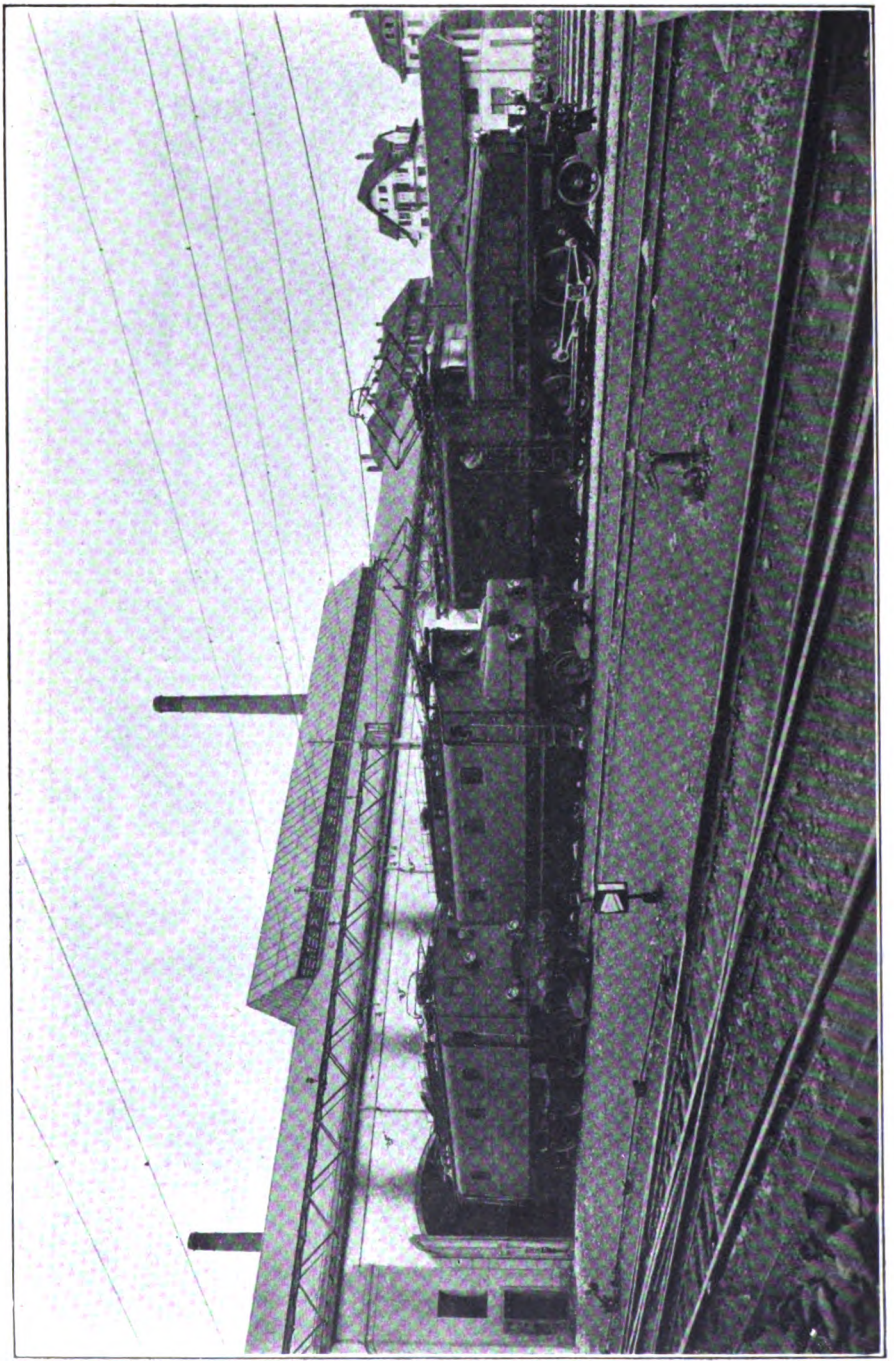

GOODS LOCOMOTIVES OF THREE DIFFERENT TYPES USED ON THE ST. GOTHARD LINE.

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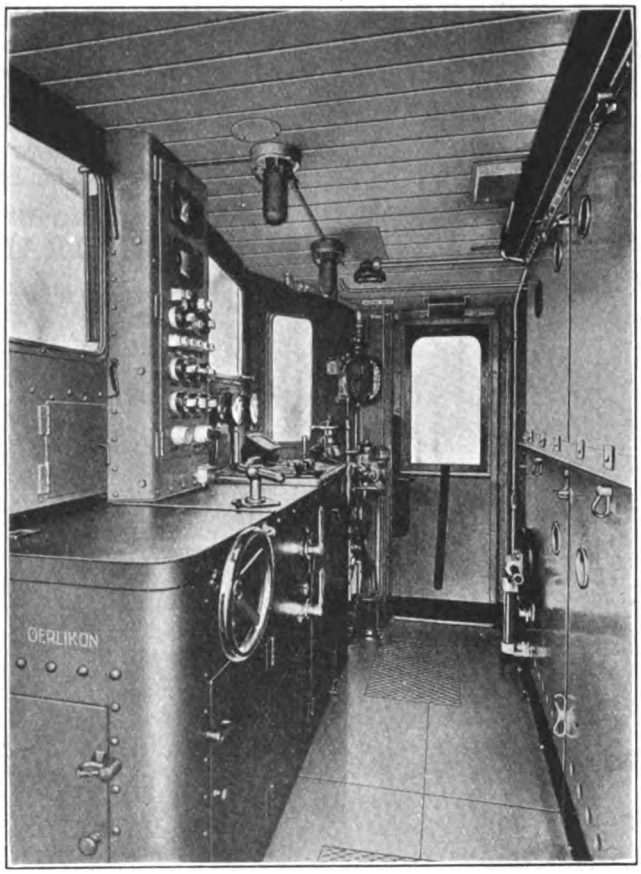
of the china insulators, and hence the pressure used is only 7,500 volts. All the telegraph and telephone offices along the line are being removed from the line to avoid interference. Overhead telegraph and telephone wires are also being removed and replaced by underground cables.

It is difficult to estimate what will be the cost by the time the whole of the line has been electrified. For instance, the iron bridges have all proved too weak for the electric locomotives. Sixty of the smaller ones, therefore, that is those not exceeding about 39 ft. span, have been strengthened by bridges of armoured concrete, with a layer of ballast. The larger iron bridges must be either strengthened by means of arches beneath (as has already been done in the case of 35 bridges), or they must be replaced by stone bridges, as in the case of the Reuss bridge, near Göschenen. Altogether 14 iron bridges have been replaced by stone ones, which are, however, now no cheaper than iron bridges. The bridges are constructed so as to be able to bear locomotives much heavier even than those at present in use. Most of the electric plant, and especially the copper wire, now comes from the United States, and is being paid for by the loan recently raised in that country by the Swiss Federal Railways.



INTERIOR OF DRIVER'S COMPARTMENT OF ST. GOTHARD PASSENGER LOCOMOTIVE.

Hitherto the chief trouble has been in connection with the power stations, not so much that of Amsteg, between Erstfeld and the tunnel mouth at Göschenen, but that on the southern side of the tunnel, the Ritom Lake power station. Everything was ready for beginning to run electric trains through the St. Gothard Tunnel on July 1 last (instead of two and a half months later), when suddenly an accident, or series of accidents, occurred to the water conduit of the Ritom Lake power station, which supplies power for trains on the south side of the tunnel. In the water conduit cracks opened up, due probably to too great pressure—as much as 4 to 4½ atmospheres. The explanation given was that the conduit was made of ordinary concrete, not armoured concrete and therefore was not strong enough. For the present, however, the difficulty seems to have been overcome, at considerable expense, of course, and loss of time. In summer the power station at Amsteg, north of the great tunnel, can supply enough power for all the line. Consequently the Ritom power station will then be used little, if at all, and the waters of the Ritom Lake accumulated for the winter. At first the Ritom power station was intended for 48,000 h.p., but now it has been developed for 72,000.

For constructing the water conduit from the Ritom Lake down to Piotta a cable

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railway more than a mile and a quarter long was constructed, with a very steep gradient. This railway will not be broken up, but next summer will be utilised as a tourist line. Parallel with it 2,400 steps lead up to the Ritom Lake, steps which on foot it takes a man two hours to ascend. This lake was tapped about 33 yards below its natural level, and by erecting a dam at its usual outlet its level was raised 22 ft., so that it has now a volume of 26,000,000 cubic metres of water available for use.

THE CORDOBA CENTRAL RAILWAY.

ALTA CORDOBA STATION, CORDOBA CENTRAL RAILWAY.

ALTHOUGH built entirely to the metre gauge, the Cordoba Central Railway ranks as one of the leading systems which have combined to give the Argentine Republic the remarkably complete railway facilities which it possesses. It is a combination of several lines, at one time separate :—(1) The original Cordoba Central line, now known as the Eastern Section ; (2) the Central Northern section ; (3) the North West Argentine ; (4) the Cordoba and Rosario Railway ; and (5) the Central Cordoba Buenos Ayres Extension line.

The actual length of the Central Cordoba Railway worked to-day is 1,940 kilometres, with a total of 149 stations. In addition to the five sections mentioned there are several short branches as follows. The whole of the lines are operated as one system, the headquarters being at the Retiro Station in the city of Buenos Ayres. A through route is provided from Buenos Ayres to Tucuman, passing through the provinces of Buenos Ayres, Santa Fé, Cordoba, Catamarca, Santiago del Estero and Tucuman. At its northern terminus, junction is made with the State Railway system, which is also of metre gauge, so that through traffic is practicable right up to the Bolivian frontier, the route throughout traversing the wealthiest and most prosperous regions of the Republic.

There are 305 locomotives in use, of which 260 are of tender classes, the remaining 45 being tank engines. Passenger rolling-stock includes 316 vehicles. Among them are 65 sleeping coaches, six family coaches, 22 dining cars and 10 kitchen cars, the remainder being adapted for general first and second-class travel. On the goods side, 6,881 wagons are employed, while brake vans for both goods and passenger duties total 187.

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Locomotive Cabs.

[No. I.]

By THEODORE HORN, B.A.

OF the genesis of the cab much is uncertain. Where and when it was invented, it is perhaps impossible to say. One recent writer* has claimed that it originated on some of the lines which now form the North Eastern Railway, in a plank cut to fit the shape of the boiler and act as some protection from the front, this simple device evolving into the weatherboard. It is at all events clear that the cab is a development of the weatherboard or "spectacle-plate," and the manner of its development is equally clear. First the weatherboard was bent over at the top (in some early examples at first only to an angle of 45 deg. or thereabouts); then rails were fitted to support its extension backwards: finally side sheets or wings were added, and these generally took the place of the rails in supporting the roof. But, as might be expected, this order of development was not invariable. In many cases the side sheets were fitted in conjunction with a plain weatherboard, but no roof, as for example on the later "Cudworth" engines on the South Eastern Railway. But it is the combination of the three elements, giving protection at front, top, and sides respectively, which may be said to constitute a cab, and when this stage was reached the real history of the cab begins. There is little room for originality or individuality in designing a weatherboard, but when a proper cab is needed there is ample room for both, and this fact primarily makes a history of the cab possible.

The credit for first providing a standard pattern of cab which offered adequate protection is probably due to that distinguished engineer Mr. Patrick Stirling, who became Locomotive Superintendent of the Glasgow and South Western Railway in 1853. All his locomotive designs from that date onward included his well known cab in its original form, with the large circular window in the side. There were, however, earlier isolated examples elsewhere. One of the earliest was a curious cab which has been described* as similar in shape to a London "hansom," fitted to a single driver well tank built in 1840 by Messrs. Stephenson for the York and North Midland Railway. Messrs. Stephenson, indeed, seem to have made a speciality of elaborate cabs. For in 1859 this firm supplied two locomotives for the Oxford, Worcester and Wolverhampton Railway, also single driver well tanks, which had very ornate erections with two side windows; and again in the following year fitted large side window cabs to two 4-4-0 locomotives built for the Stockton and Darlington Railway to the designs of Mr. Thomas Bouch. But these engines (Nos. 160 and 161) were and remained unique on that line in this respect. These attempts to provide adequate cabs were but spasmodic. The Glasgow and South Western Railway alone of all British railways in the 'fifties could exhibit a standard locomotive cab.

But other railways soon followed suit, though few of these had evolved anything like a standard pattern. The "Stirling" cab naturally went with its designer to Doncaster in 1866. The North Eastern began to accumulate its wonderful assortment of cabs. Many curious examples were fitted to Mr. Sinclair's singles on the Great Eastern Railway. Perhaps as interesting as any were the cabs designed in 1862 by Mr. Barclay for the Inverness and Aberdeen Junction Railway (afterwards part of the Highland Railway), of which more presently. It was not, however, till the beginning of the next decade that some of the most important lines adopted the practice, as for example, the Midland Railway in 1871 and

* Mr. W. J. Gordon, in "Our Home Railways."

* Mr. E. L. Ahrons, RAILWAY MAGAZINE, December, 1916.

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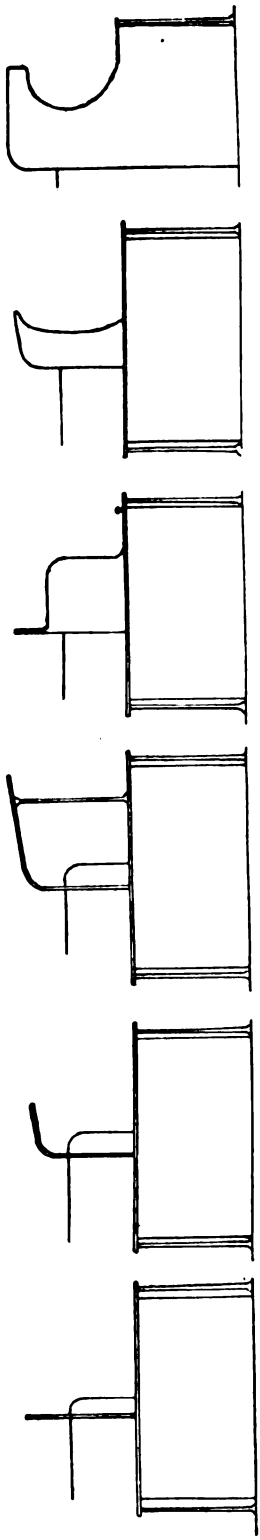

STAGES IN THE EVOLUTION OF THE LOCOMOTIVE CAB.

Plain weatherboard. Weatherboard with bent-over upper portion. Front and roof protection. Weatherboard with sidesheets. A further step forward. A sufficient type.

the London and North Western in the following year. But by this time the cab had become an established fact, and from 1875 or thereabouts onwards it has been the exception for any locomotive in this country to be constructed without some form of cab. Furthermore at this same time the fitting of cabs to older classes of locomotives proceeded apace.

It is clearly impossible to trace in detail the history of the cab on all railways. Of the designing of cabs, as of the making of books, there is no end. There are round cabs, square cabs, arched cabs, flat cabs, cabs neat and shapely, cabs ugly and shapeless. But before proceeding to discuss certain lines of development in detail, it is interesting to note a few general features. In the first place, many cabs clearly show their origin. Thus early cabs on the Caledonian and North British Railways had a distinctly rounded bend from the spectacle plate to the roof, a manifest relic of the old bent-over weatherboard. Or take the early London and South Western Railway engines, as illustrated in the October, 1920, RAILWAY MAGAZINE. The transition from the original bent-over weatherboard to the scanty "Beattie" cab and then to the neat design of Mr. Adams is likewise distinctly traceable. Again, another remarkable feature was the extraordinary variation in design on the same railway, not only as between different classes of locomotives but between different batches of the same class. Take for example the 2-2-2 singles of Mr. Sinclair's design on the Great Eastern Railway, built between 1862 and 1867, or a more extreme case, the North Eastern Railway under Mr. Fletcher's régime, to which Mr. Ahrons referred at length in his recent articles dealing with that railway. Here not only did each of the four chief "shops" have its own entirely distinct design, but the matter was complicated by outside locomotive firms fitting a pattern of their own to those engines they supplied. Surely the variation of species could go little further than this. It did, in fact, for when Mr. T. W. Worsdell introduced his standard cab in 1886, the collection had been enriched by Mr. McDonnell's importations from Inchicore and the Stirling pattern of the "Tennants."

Apart from the special designs men-

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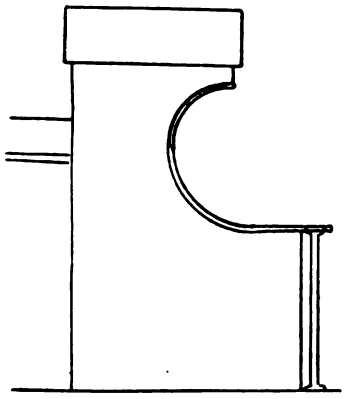
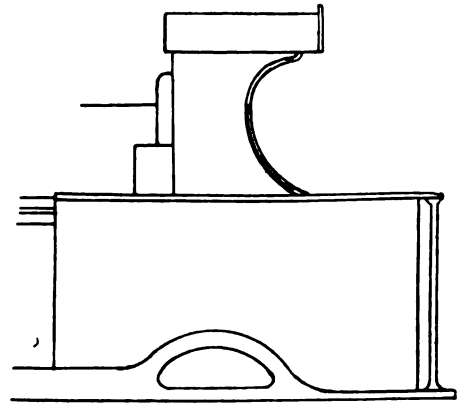
tioned hereafter, probably the most general type of cab is that which has the side sheets cut away to a sweeping curve from the roof to the waist line. Few railways have not at some time or other used this pattern, sometimes in combination with what is rather erroneously called a square splasher. In its most modern form, with the roof extended to the rear and the handrails carried up to meet it, this is still the standard design on many railways, notably the Great Central (till last year), the South Eastern and Chatham, and the Midland. The Midland, indeed, started with the so-called square splasher type in Mr. Kirtley's 2-4-0 design of 1871, and has since used both types, turn and turn about, with a gradual development fitted to the "Newtons" of Mr. Ramsbottom's design.

It is now time to turn to what are probably the two most famous cab designs, the Stirling and the Stroudley cabs. Notable in themselves, these have become still more so by their use on many lines geographically widely separated, but linked together by reason of continuous locomotive development. The Stirling cab is prior in date: it was introduced, as mentioned above, on the Glasgow and South Western in the 'fifties. In its original form it was an all-over cab of singularly severe outline, with a circular window in each side sheet, and was fitted to Mr. Patrick Stirling's 0-4-2 goods locomotives, and in 1866 to his famous



STANDARD TYPE OF CAB.

Great Western and Lancashire & Yorkshire Rys.



STANDARD TYPE OF CAB.

London & North Western Railway.

to the large cabs of Mr. Deeley's design with the handrails running up to the roof, and the roof extended right back over the tender front. The Great Western still uses the original pattern, naturally much modified, and a modern Great Western cab with its lofty arched roof and high setting presents a remarkable appearance. One curious edition of this type was the cab used by Mr. Sacré on his M.S. and L. engines, with a small oval window in each side sheet.

One of the most consistent designs is that of the London and North Western. Apart from the inevitable increase in size and the extended roof and handrails, the type as used on the "Claughtons" of to-day is essentially the same as that introduced by Mr. Webb in 1872 and first 2-2-2 passenger engines. When this gentleman departed for Doncaster in 1866, he took this design with him, and his brother, Mr. James Stirling, who succeeded him at Kilmarnock, continued the design there. But within a few years both brothers altered the type, making it smaller and omitting the side window. Why this alteration was made it is not easy to see, as the modified type provided considerably less protection. However there must have been some valid reason, for the original pattern was never resurrected, though Mr. James Stirling in a manner combined the two on his 2-4-0 class of 1870–1. On the Glasgow and South Western the modified type was continued by Mr. Smellie and lasted till 1891, when it was abolished by

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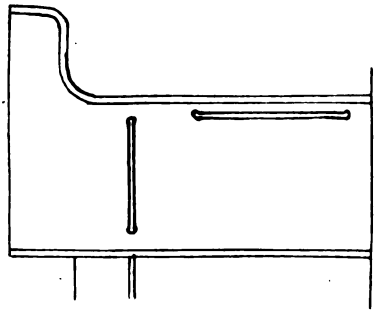
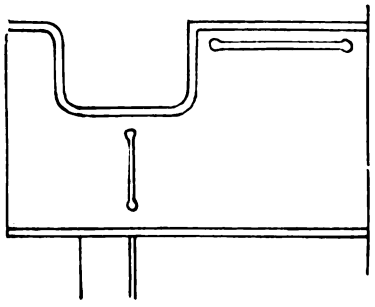
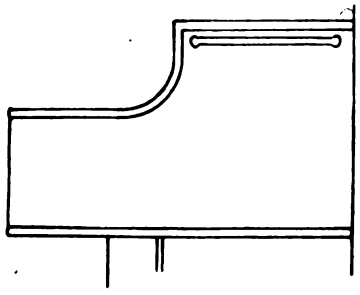


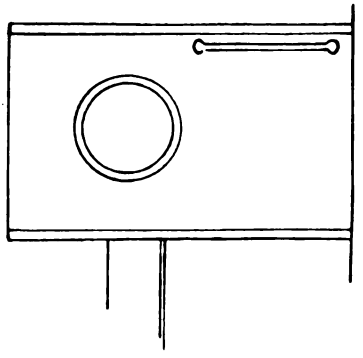
H. & B. Ry. Pattern (0-8-0 class).



Mr. Ivatt's Pattern. G.N. Ry.



Later Pattern. G. & S.W., G.N. and S.E. Rys.



Original Pattern. G. & S.W. and G.N. Rys.

THE STIRLING CAB.

Mr. Manson. But on the Great Northern the type was to be again modified by Mr. Ivatt, who on his first design extended the roof to the rear, leaving somewhat square openings in the sides. Now the most remarkable point about this development is that whereas the original Stirling cab was distinctly "round," under Mr. Ivatt's modifications it became "square" and flat: and this flat roof was retained even for the large "Atlantics," and was only sensibly rounded again on Mr. Gresley's large-boilered 2-6-0's, and still more so on the latest of that type, Nos. 1000 and 1001. So much then for the Stirling cab on the Great Northern.

Meanwhile, Mr. James Stirling had in 1877 gone to the South Eastern, and had taken the family cab with him. On this line it became standard until 1898, when Mr. Stirling, casting tradition to the winds, designed an entirely new type of cab for his 4-4-0 class of that year. The Stirling cab again made its appearance on the Hull and Barnsley, with the appointment of Mr. Matthew Stirling as Locomotive Superintendent in 1885. But here again it has been modified by an extension of the roof, and in the 0-8-0 goods engines by a similar extension with no openings in the side sheets. From 1882 onwards under Mr. Holmes the North British provided a cab of the Stirling type, which lasted till the introduction of side window cabs in the present century. Previously indeed Mr. D. Drummond had used a Stirling cab on his rebuilds of the "211" class of singles in 1880, though it was not his standard type. Curiously enough he likewise used the same type for his first rebuilds of the 2-4-0 engines on the Caledonian in 1882–4. Finally two spasmodic appearances of the Stirling cab must be mentioned, one on the Lancashire and Yorkshire in 1875–6 on eight 0-4-2 goods engines built by Messrs. Sharp, Stewart and Co., to Great Northern designs, the other in 1884–5 on the well-known 2-4-0 "Tennants" of the North Eastern, though these, in common with many older North Eastern cabs had square windows in the spectacle plate. Indeed many engines on this line, particularly those emanating from Darlington, had cabs which were very similar to the Stirling design, though "squarer" and flatter than the genuine original.

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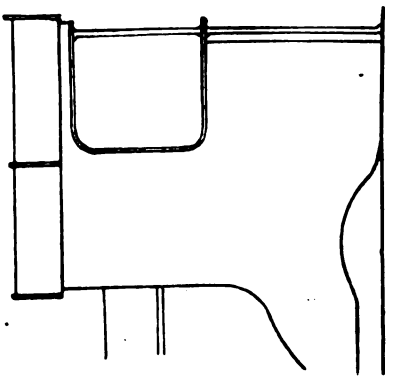
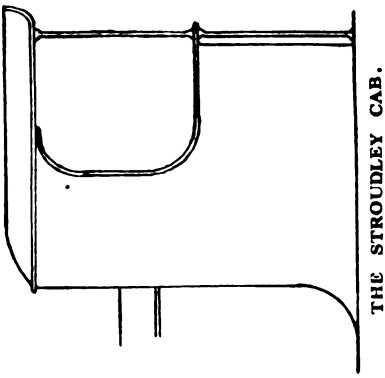
Equally notable is the Stroudley cab, which is always popularly associated with the Brighton Railway; where its neat outline undoubtedly helped to make the locomotives of that line some of the prettiest that ever ran on wheels. But in reality the influence of the Stroudley design was far more widespread, and for its origin we must go back to the Highland Railway, where Mr. Stroudley was locomotive Superintendent from 1865 to 1870. Here his authentic cab probably first appeared on a rebuild as a 2-4-0 of No. 1 *Raigmore*, originally a 2-2-2 built for the Inverness and Nairn Railway in 1855 without a cab. All the Stroudley characteristics were present — the handrails carried up to the roof, the large square opening in the cab sides, the flat-topped spectacle plate, with the roof rising from it to form a sort of arched clerestory, and all corners neatly rounded to a gentle curve. But at the same time it must be pointed out that though more graceful, this cab was very similar to the pattern designed by Mr. Barclay for two singles of the 2-2-2 type belonging to the Inverness and Aberdeen Junction Railway in 1862; these were No. 12 *Belladrum* and 13 *Lovat* which passed to the Highland Railway on the amalgamation in 1865. A similar cab was also fitted to the 2-4-0 goods engines of Mr. Barclay's design and built in 1862–4. The chief difference between these and Mr. Stroudley's design being the extreme "squareness" of the former. But the essentials of Mr. Stroudley's design were there, and his own cabs, though much neater, were clearly a development of the design of his predecessor.

On the Brighton Railway the Stroudley cab appeared first on the new and rebuilt 2-4-0 locomotives of 1871, and the type at once became standard, and though necessarily modified in respect of size and the shape of the roof, the tradition has been maintained there to the present day. On one other railway the Stroudley cab appeared in its original form. Mr. D. Drummond had been works manager at Brighton under Mr. Stroudley, and when he became Locomotive Superintendent of the North British in 1875, the Stroudley cab promptly appeared along with other Stroudley characteristics, first on the two 2-2-2 singles of the "Berwick" class, and then on the 4-4-0 and 0-6-0 classes of 1876

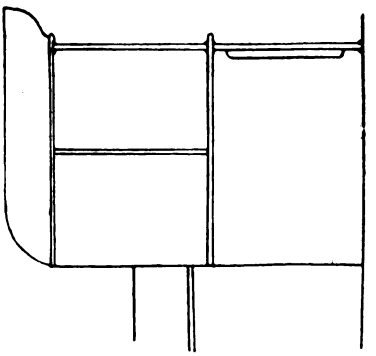


Cal., L. & S.W., High. Rys., &c.
Messrs. D. & P. Drummond.



THE STROUDLEY CAB.

L.B. & S.C.R.
Mr. Stroudley.



H. R., 1862.
Mr. Barclay.

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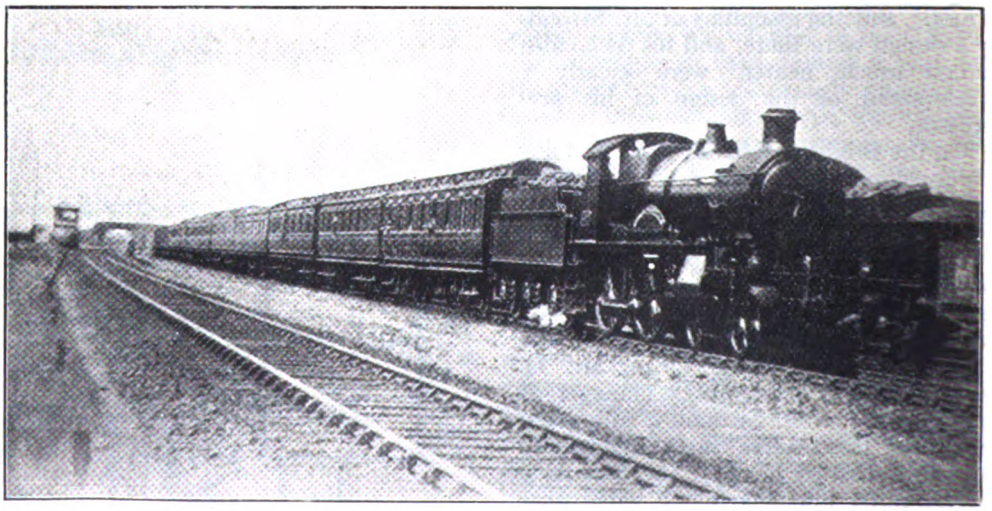
and subsequent years. Mr. Drummond did not however fit this type of cab to rebuilds, and as mentioned above, it was gradually replaced by the Stirling pattern under Mr. Holmes's régime. But, thus ousted on the North British, the Stroudley cab appeared under Mr. Drummond on the Caledonian. True, the old shape of roof was modified, and the cab front had a rounded instead of a level top, but in other respects the Stroudley influence remained, and with the exception of a few side-window cabs and the alteration of the side openings from a square to a rounded shape, Mr. McIntosh and Mr. Pickersgill after him have preserved the type.

Mr. Drummond went to the London and South Western in 1895, and once more the Stroudley cab (what was left of it) went south. The Drummond-Stroudley cabs of the South Western engines were exactly identical in outward shape with those of the Caledonian. But, curiously enough, the cab soon became a family affa r, for Mr. Peter Drummond, who had likewise served under Mr. Stroudley at Brighton, became Locomotive Superintendent of the Highland in 1896, and thus the Stroudley influence returned. As a matter of fact the Highland cabs had changed little. Mr. Jones' design retained the extremely square outline of Mr. Barclay's original pattern, a squareness which was accentuated, if the expression be permitted, by the curious way in which the front corners of the cabs were rounded. The front windows remained square as they had done even in Mr. Stroudley's time. But Mr. Drummond's cabs as fitted first to the small "Ben" class were of the complete Drummond-Stroudley pattern. Indeed, not only in respect of cab design, but of general outline, the small "Bens" and the early Drummond Caledonian and South Western 4-4-0's presented a remarkable similarity of appearance. Finally, when Mr. P. Drummond migrated to the Glasgow and South Western in 1912, he took with him a similar cab, larger but still unmistakably belonging to the same genus, (such as had been fitted to the large "Bens"), and this now appeared on the large 4-4-0's and 0-6-0's of 1913. It is curious that this type of cab should have flourished at once on four Scottish railways and the two most southerly English lines.

(To be continued.)

UP WEYMOUTH EXPRESS, GREAT WESTERN RAILWAY.



4-4-0 ENGINE No. 3812, "COUNTY OF CARDIGAN."

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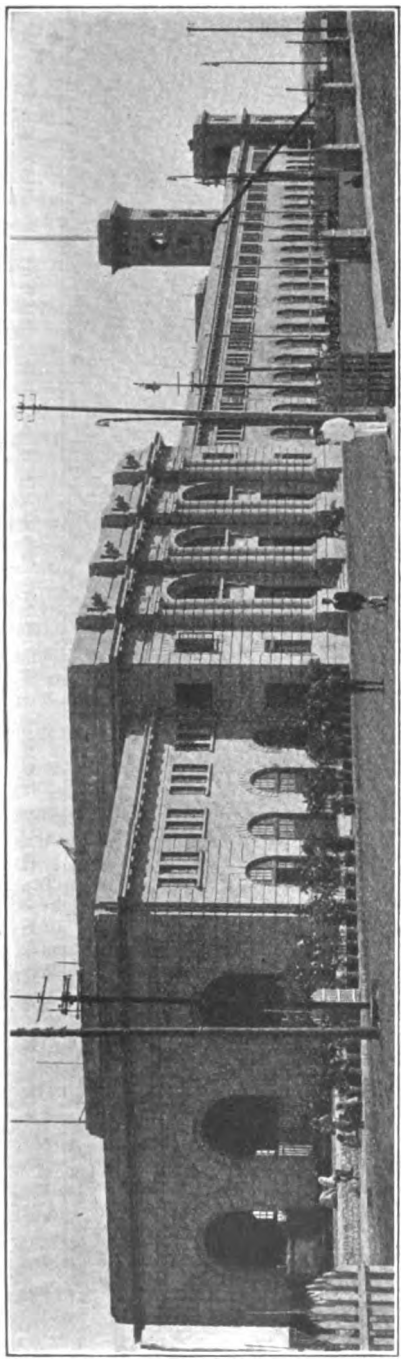
Port and Dock Railways in Bombay.



BALLARD STATION & OFFICES, BOMBAY PORT TRUST RAILWAY.

A CHIEF centre of trade, and one of the principal ports of India, Bombay is well equipped with docks and railway connections and facilities therefor, and the following particulars of the Bombay Port Trust railways will therefore be of interest.

Owned and operated by the Bombay Port Trust, few railways in India have a more dense merchandise traffic than the 100 miles of track known as the Bombay Port Trust Railway. This is owned and operated by the Bombay Port Trust, and links up every portion of the Bombay docks estate with the Great Indian Peninsula Railway. Bombay has for long been the principal port of India, and the rapid growth of its shipping trade in recent years may, in no small measure, be attributed to the enormous economy of time and labour which has been effected in the handling of merchandise at the docks as a result of the replacement of the old form of transport between ship, dock warehouse and railway truck, consisting of slow-going, lightly-loaded bullock carts, by this all-embracing system of docks railway.

It was only in January, 1915, that the Bombay Port Trust Railway came into being, and its construction proved both expensive and laborious, as it involved the solution of numerous engineering difficulties inseparable from railway construction in a busy industrial and dock area. Every portion of the dock estate had to be reached, land re-claimed from the sea, several main roads bridged, marshalling and storage sidings provided, a docks railway station constructed, and junctions effected with the main line railways connecting Bombay Docks with all portions of India. Forming part of a comprehensive scheme for the improvement of the terminal facilities available at the port, there has proceeded hand in hand with the construction of the Port Trust Railway, the erection of numerous extensive warehouses and stores on the docks estate, and the provision of additional cranage and similar facilities on the quays. It has also been found possible, by the

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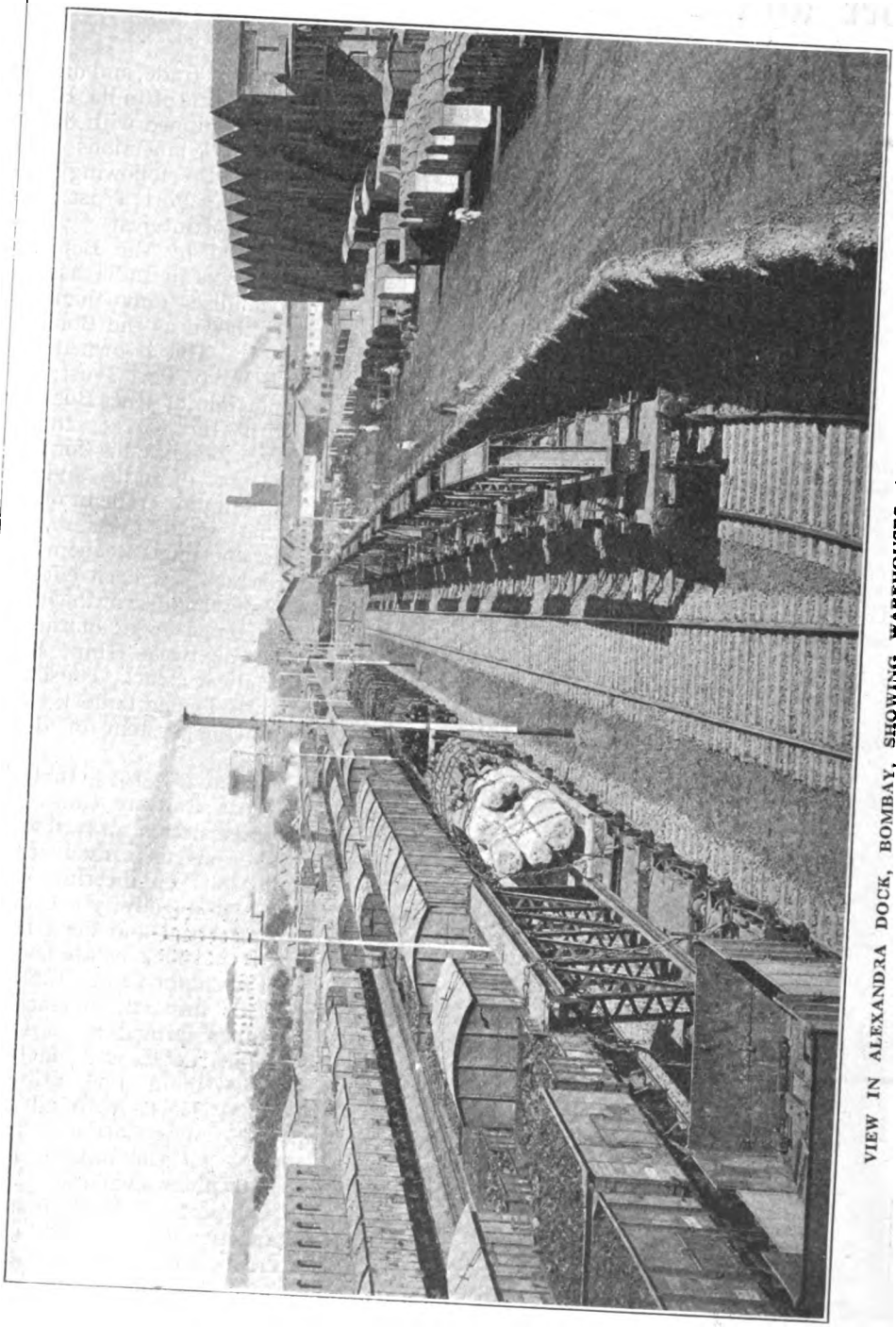

VIEW IN ALEXANDRA DOCK, BOMBAY, SHOWING WAREHOUSES AND RAILWAY FACILITIES.

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construction of the railway and the provision of improved storage accommodation, to centralise on and around the docks much of Bombay's extensive trade in cotton, grain, seed and coal, to the mutual advantage of carrier and merchant.

The principal wet docks in Bombay are the Alexandra, Victoria and Prince's Docks, opened in 1914, 1888 and 1880, respectively, and the graving docks the Hughes and Merewether Dry Docks. The water area of the three largest wet docks is some 105 acres, with approximately 23,000 lin. ft. of quayage and over 3,000,000 sq. ft. of warehouse and transit shed accommodation. The Hughes Dry Dock is 1,000 ft. in length and 100 ft. wide; and the Merewether Dry Dock 505 ft. long and 65 ft. in width. Prior to the construction of the Alexandra Dock the whole of the merchandise passing between Bombay docks and the interior of India was dealt with at the two railway termini at Wadi Bunder and Carnac Bridge respectively, but with the greatly increased traffic passing through the port the railway facilities available proved quite inadequate to deal with the business, and so the programme of improved facilities, which has now been practically completed, was prepared, giving, in addition to vastly increased warehouse accommodation on the docks estate, direct railway communication between the Great Indian Peninsula Railway and the dock warehouses and docks.

To-day traffic passing between the docks and the interior stations in India is collected in an extensive gravitational sorting yard at Wadala, 6 miles distant from the new Ballard station of the Bombay Port Trust Railway on the Deep-water Pier. The Wadala yard is laid out on particularly liberal lines, and in view of the very great developments which are certain to take place at the Port of Bombay in future years, provision has been made to allow of further extensions to the marshalling sidings when this becomes desirable. Near the junction of the Bombay Port Trust and the Great Indian Peninsula Railways is situated the Kurla station of the latter line.

From the Wadala sorting sidings the train-loads of wagons there made up, containing traffic for shipment at the various docks, are hauled over the Port Trust Railway to the particular portion of the docks estate where they may be required, and upon unloading become available for the transport of inwards traffic *ex* steamer or dock warehouse. By the provision of sidings of echelon design, serving the various warehouses on the quays, wagons may be placed in or removed from any particular road without interference with operations in other sidings. Sorting yards laid down adjacent to the docks also enable the further division of loaded trains received from Wadala main sorting sidings, and the collection of empties becoming available on the dock lines, to be expeditiously carried out, and the marshalling of up-country traffic thereby facilitated.

The programme of improvements embarked upon by the Bombay Port Trust included the provision of numerous depôts on the docks estate for the storage by merchants of their goods. Of these the grain and cotton depôts are the two more important. The grain depôt has been completed, and consists of 12 warehouses with ample siding accommodation, while the cotton depôt, with equally liberal railway facilities, is at present fast nearing completion. In addition to these stores, plots are reserved for smaller traders adjacent to the railway, and a large general goods station is also being provided to deal with merchandise brought in from up-country in less than wagon loads.

At the seaward terminus of the Port Trust Railway the Ballard Railway station has been built alongside the Deep-water Pier. It is an imposing stone building, and although by no means of such great architectural beauty as the Victoria Terminus, the Bombay headquarters station of the Great Indian Peninsula Railway, there are few stations of its size in England to compare with the Ballard station for outward beauty of design. The lay-out is also all that could be desired, and the new station is proving of immense service in dealing with passenger traffic at the docks.

In addition to the improved railway facilities provided at the Port of Bombay itself, there have been completed in recent years many great improvements on the Bombay main line of the Great Indian Peninsula Railway. The whole of

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the line between Bombay and Kalyan, 32 miles distant, has been quadrupled, and the crossing of the Thull Ghat facilitated by re-modelling the alignment of the line at this point. Until the year 1912 a double line of track had to support the whole of the immense traffic into and out of Bombay city and docks, and congestion was, in the circumstances, inevitable. The opening of the quadrupled track in 1916, and the construction of new stations and sidings between Bombay and Kalyan, has, however, increased enormously the capacity of the line, and resulted in material acceleration of shipment traffic to and from the Port of Bombay.

NEW GARAGE FOR MOTOR CARTAGE VEHICLES,

GREAT WESTERN RAILWAY.

A NEW garage has recently been brought into use at Westbourne Park for dealing with the large fleet of motor cartage vehicles oPerated by the Great Western Railway in the London area. There is one main bay, with adjoining workshops and stores, so designed that one or more similar bays can be easily added as required. Vehicles enter at one end, pass through the garage, emerge from the further end and then circle the yard, picking up petrol and water, to reach the main gates. Petrol is supplied from an underground tank to an overhead 40-gallon reservoir having a graduated gauge glass, whence it passes to the vehicle's tank by gravity, the amount supplied being recorded. A second halt is made for water, supplied through a special type of water column.

The stores and workshops are well equipped and laid out, and provision is also made for charging the numerous electric vehicles now used by the Great Western Railway. Current is obtained from the Park Royal power station.

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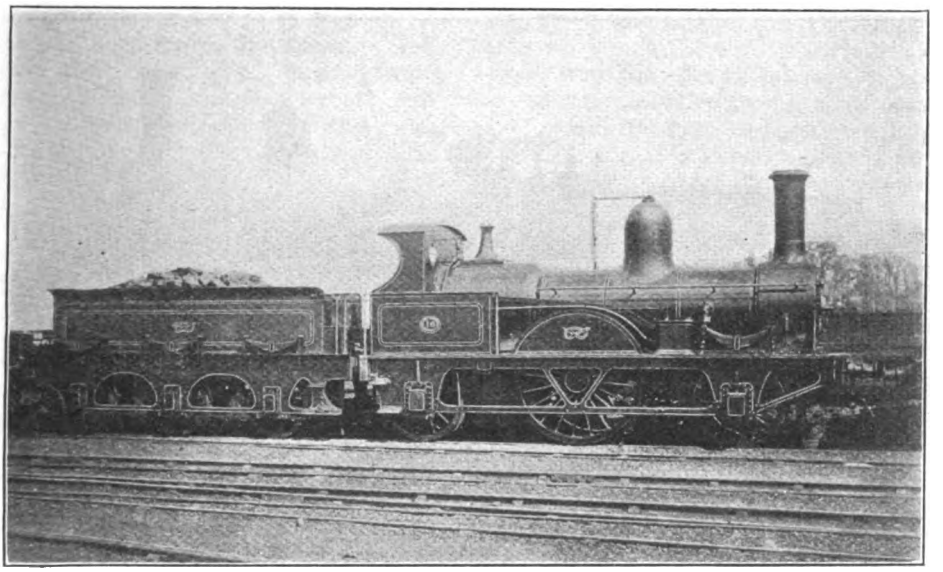
Locomotive and Train Working in the latter part of the 19th Century.

NORTH STAFFORDSHIRE RAILWAY. [No. 1.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THIS railway is unlike any other in the United Kingdom, and occupies a territory of its own, most of which is in North Staffordshire, but it extends its arms into Derbyshire on the east, and into Cheshire on the north and north-west, at the same time managing to poke a foot over the Shropshire border into Market Drayton on the west. The expression "territory of its own" requires, however, considerable modification, if the extensive running powers of other companies, especially the London and North Western, be considered. This latter company has running powers, which are freely exercised, over the whole of the North Staffordshire lines, and the Midland and the Great Northern companies also possess running powers to a considerable extent. Nevertheless, the North Stafford has not sold its birthright for a mess of pottage, for in return it runs its own trains over many miles of the lines of all the companies mentioned, and in most cases for both passenger and goods trains. The wonderful thing is that this comparatively small railway has not long ago been absorbed by one of the other large railways, the London and North Western having probably had the best opportunity of conducting the swallowing-up process. Nevertheless, the North Staffordshire has managed to preserve its independence since 1847, and "run over but not crushed" might be a good motto to tie on to the emblematic Staffordshire knot.



2-2-2 LOCOMOTIVE, No. 16 (SERIES 16-18, 20-25).

Originally built by Kitson & Co. in 1848, and rebuilt at Stoke, 1869. Driving wheels, 6 ft. 1 in. diam. Cylinders. 15 in. by 22 in.

There are two main lines arranged

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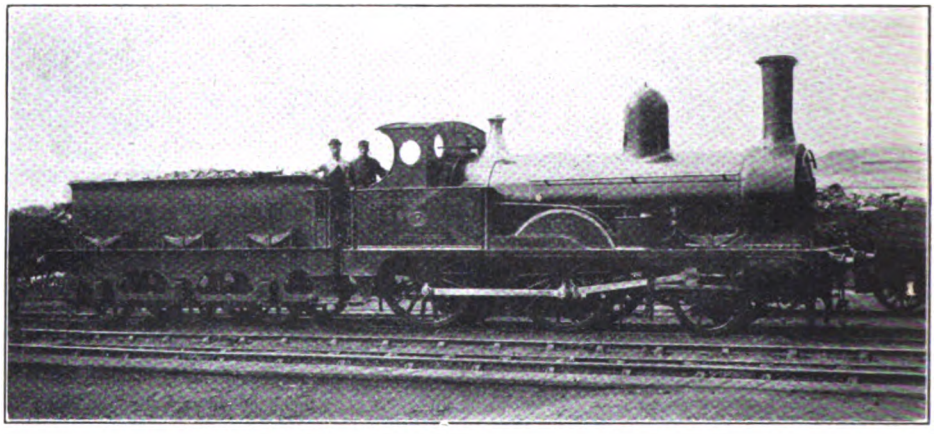
somewhat like a pair of scissors. The north and south line extends from Macclesfield through Stoke to a junction with the London and North Western main line at Colwich, a total distance of 38¼ miles. The other main line runs from Willington Junction on the Midland, near Derby, through Stoke to Crewe, the general direction being south-east to north-west, and the total distance 45¾ miles. Of this distance, the joint of the scissors, a length of 6¼ miles between Stoke and Harecastle, is common to both main lines. The remainder of the railway consists of an intricate system of loops and branches, for the understanding of which readers should study a map. One of these branch lines is that known as "The Loop," and is of considerable local importance. It leaves the main line about one mile north of Stoke at a spot which some Staffordshire classic called Etruria, and passes through a continuous series of pottery towns to Tunstall, continuing thence to a junction with the main line near Kidsgrove. If the shade of Lars Porsenna could visit the Staffordshire Etruria, he would, I am afraid, be considerably aghast at the brand of scenery, which is very far removed from what was the Etruscan idea of such things.

Of the extensive running powers exercised by the North Staffordshire, some are comparatively modern arrangements, but certain others, which existed for many years prior to 1900, deserve special mention. The most important were those in virtue of which the North Staffordshire ran its own passenger and goods trains over the London and North Western Railway from Macclesfield through Stockport to Manchester (London Road). These running powers date back to 1867. For many years the North Stafford stationed a goods engine—usually old No. 95—at the London and North Western shed at Longsight, though I do not remember that any passenger engines were kept there. At the other end of the line there were running powers from Colwich to Walsall and Birmingham (New Street). I have sometimes seen North Staffordshire passenger engines at Birmingham, but I think the running powers for passenger trains were exercised intermittently. There were also the important powers into Derby (Midland) 5¼ miles from Willington Junction, and also those for about ¾ mile into Burton (Midland) station. Between Crewe and Liverpool excursion and goods trains were worked over the London and North Western, and excursion trains ran to Nottingham (Midland) from Willington Junction via Castle Donington and Trent.



2-4-0 LOCOMOTIVE, No. 7 (SERIES 7, 10 & 71).

Designed by Mr. Angus and built at Stoke about 1874. Coupled wheels, 5 ft. 6 in. diam. Cylinders, 16 in. by 22 in.

There were three different types of main line passenger tender engines in use during the period 1878 to 1882. The first

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consisted of nine single engines of the "Jenny Lind" type with 6 ft. 1 in. driving wheels and 15 in. by 22 in. cylinders. These engines, which were Nos. 16 to 25, omitting No. 19 scrapped several years previously, were not true "Jenny Linds" for they were not built by Messrs. E. B. Wilson & Co., but had come from the neighbouring works of Messrs. Kitson, Thompson & Hewitson, in 1848. Nevertheless, as regards arrangement of framing with inside bearings for the driving wheels, and outside for the leading and trailing wheels, they were almost exactly similar to the celebrated "Jennies." The domes had round tops with spring balances, and the raised fireboxes were surmounted with a square whistle mounting. These engines had been rebuilt at Stoke, most of them in 1869, and were to be seen on both main lines until they disappeared between 1882 and 1886. Several were stationed at Stoke and Macclesfield, and until they were scrapped, worked the greater number of North Staffordshire trains which ran into Manchester. No. 23 which, by the way, was the last of the class to disappear in 1886, was usually to be found on the line between Stoke and Derby.

There were three 2-4-0 passenger engines Nos. 7, 10 and 71, with horizontal outside cylinders, 16 in. by 22 in., and 5 ft. 6 in. coupled wheels, and had been built at Stoke about 1874 by Mr. Angus at that time chief locomotive superintendent. These engines had leading wheels only 3 ft. 6 in. in diameter, and within my recollection of them, between 1882 and 1894, when they disappeared, were always stationed at Derby for those trains to Stoke and Crewe which were worked from the Derby end. They had at one time cabs with circular side windows, somewhat similar to those used by Mr. Sacré on the Manchester, Sheffield and Lincolnshire Railway. Being stationed at Derby, they were rarely, if ever, to be seen on the Macclesfield and Manchester section, and their duties were mostly confined to the stopping trains.

The third type consisted of six 2-4-0 engines with inside cylinders, and inside frames, and may be considered to have been the North Staffordshire express engines of the period. One of these, No. 19, built at Stoke in 1872, was the only engine on the line that had 6 ft. 6 in. wheels, and it may be added that no other North Staffordshire engine before or since has had coupled wheels larger than 6 ft. 1 in. diam. The cylinders were stated to have always been 17 in by 24 in., but I think that they were 16½ in. by 22 in. during the earlier years of the existence of the engine. But the cylinders were certainly 17 in. by 24 in. in later years, after No. 19 had been rebuilt by Mr. Longbottom. A peculiar feature in its early days was the valve gear, which was of the Dodds wedge motion pattern. In this motion there was only one eccentric for each valve instead of two, and no link was required. The eccentric sheaves were moved into fore or back gear by means of wedges sliding laterally upon the axle, which was of square section at that part over which the wedges moved. The wedges were thus drawn sideways through the eccentrics, which were moved across the axle towards the front or back as required. The gear caused a good deal of trouble, and afterwards the link motion was substituted in No. 19 and a number of goods engines which had also been fitted with the wedge motion.

The other five engines had 6 ft. wheels and 16½ in. by 22 in. cylinders. Of these Nos. 38 and 39 had been built at Stoke in 1874, and No. 13, 14 and 15 by Messrs. Dübs & Co., in 1875. Their outward characteristics were tall round-topped domes, and raised fireboxes, upon which brass safety valve casings, almost similar to those used by Mr. Johnson on the Midland, were mounted. Nos. 38 and 39 had bent weatherboards, but the three engines by Dübs had peculiar rectangular-shaped cabs with square side windows. A few years later all five engines were modified by the provision of cabs of the usual North Staffordshire pattern, and the substitution of Ramsbottom safety valves for the brass casings and lock-up valves.

These six 2-4-0 engines were the élite of the North Staffordshire locomotive stock, and naturally did what was considered to be the express work, though their general dimensions were such that they would hardly have ranked as more than third-class passenger engines on many other railways. They were stationed at Stoke, and worked the most important

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trains over both the Stoke-Manchester, and Crewe-Derby main lines.

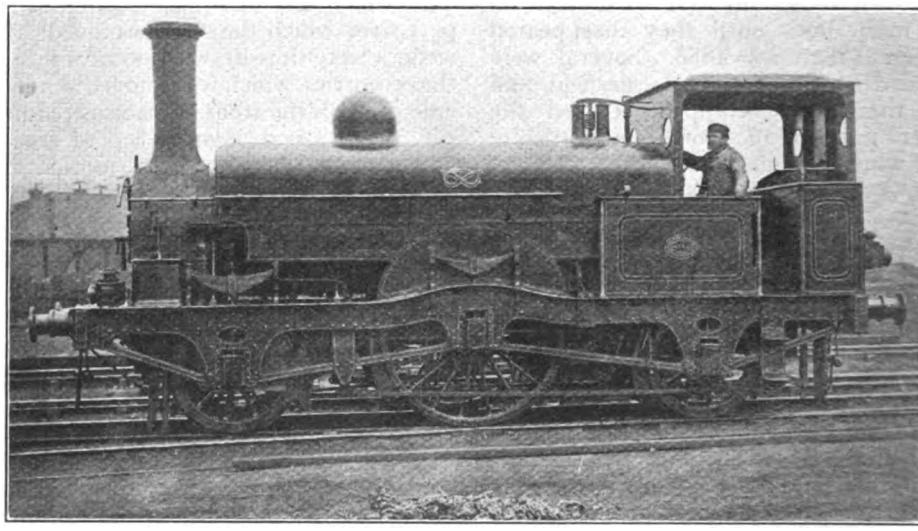
Having given some account of the main line tender engines, a few particulars of the train services may be added. There were in 1880 three "fast" trains in each direction between Derby and Crewe, which averaged 1 hour 40 min. to 1 hour 45 min. for the 51 miles. And it may be said that the improvement on these times was very small during the subsequent 30 years. But one of the 1880 trains, the 8.12 p.m. from Derby, was better than any train the company has ever had since. This train was timed as follows :—

Derby	dep. 8.12 p.m.		
Uttoxeter (Bridge Street)	arr. 8.40 ...	dep. 8.42.	
Stoke	,, 9.6 ...	,, 9.8.	
Crewe	,, 9.30.		

from Derby, and unfortunately the 8.12 itself was not a long-lived train, for it disappeared from the time-table a short time afterwards.

The highest speed between stations was not, however, attained by the 8.12 from Derby, but must be put down to the credit of the 4.40 p.m. from Crewe in the opposite direction, which averaged just over 42 m.p.h. from Longton to Uttoxeter (Bridge Street).

Uttoxeter is not exactly a large city, nevertheless it boasted of three North Staffordshire stations in 1880, two of which have since been suppressed. There were two on the main line viz. : Uttoxeter Junction, and Bridge Street stations, the latter being the principal one at which



2-2-2 SADDLE TANK LOCOMOTIVE No. 2.

Originally a tender engine built by Sharp, Bros. & Co., in 1848, Rebuilt at Stoke, 1881. Driving wheels, 5 ft. 6 in. diam. Cylinders, 15 in. by 20 in.

The running speeds were 41·8, 41·25, and 40·9 m.p.h. for the three sections respectively, and remain the best scheduled performances the railway has ever done on this portion of its main lines. Comparing them with the 2.5 p.m. through express from Derby to Llandudno of 1912, the 1880 train took one minute less to Stoke, and ten minutes less time to Crewe, for between Stoke and Crewe the Llandudno express made three stops. There was in 1880 no express in the opposite direction corresponding to the 8.12 p.m.

the fast trains stopped. There was also Uttoxeter (Dove Bank) station on the Churnet Valley line ; this has also disappeared.

Dealing with the fast trains in 1880, on the north and south line, these were mostly worked by the London and North Western as through trains between Manchester and London, via Stoke. The 7.45 a.m. from Manchester was the train made celebrated in after years by the North Western engine *Charles Dickens* which began to work it in 1882. In 1880

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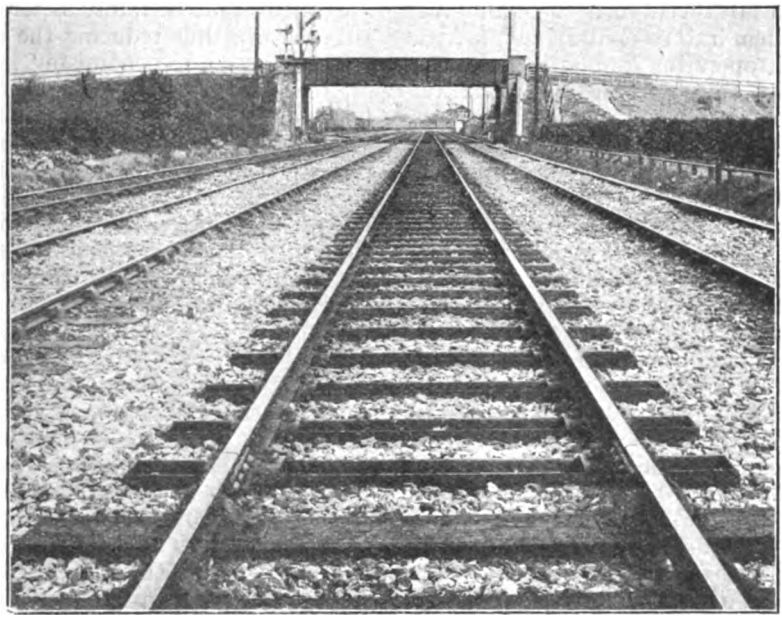
it was worked by two "Lady of the Lake" class on alternate days; these ran through from Manchester to London and back, via Stoke in both directions. The 12 noon London express from Manchester has been for many years worked by a North Staffordshire engine between Manchester and Stoke, but I do not know whether this was the case as far back as 1880. In the opposite direction the 12 noon from Euston was worked from Stafford via Stoke by a North Staffordshire 2-4-0 engine, and timed as follows:—Stafford, dep. 3.24; Stoke arr. 3.49, dep. 3.56; Macclesfield, arr. 4.27, the running speeds being 38½ and 38¾ m.p.h. The 4 p.m. from Euston was always worked direct via Colwich Junction and Stone Junction by the North Western engine, which left Manchester for London at 7.45 a.m. This train took 30 min. from Stoke to Macclesfield, a speed of exactly 40 m.p.h., and a fast morning train worked by a North Stafford engine was also allowed the same timing.

(To be continued).

STEEL SLEEPERS ON THE NORTH EASTERN RAILWAY.



DESIGNED by Mr. C. F. Bengough, Chief Engineer, North Eastern Railway, a section of the main line has been laid with these sleepers since August, 1919, with good results, carrying 100 lb. rails and the heaviest and fastest traffic. The sleepers consist each of a steel channel in which are fitted inverted channel saddle pieces to which the rails, in this case of flat-bottomed type, are secured by the usual fastenings.

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The Internal-Combustion Locomotive in Railway Service.

STEAM locomotives are adapted to all classes of railway traffic. It is mainly a question of weight and proportions, with certain characteristics of design to meet the particular conditions imposed. As to whether the steam locomotive can be made to do all classes of work, on main and secondary lines, or shunting operations in yards and sidings, on the best and most economical basis, is, however, a point worthy of debate. The alternatives to a steam-actuated railway engine are provided by the electric and the internal-combustion locomotive, both of which have been advanced to a stage that has brought them into recognition as practical means of operating traffic and taking part in the daily routine of the railway in the movement of trains and for shunting work in goods and coal yards, as well as other incidental service of a less frequent but essential character.

Of the two, the electric locomotive has been developed to a larger extent than the internal-combustion type, mainly in connection with passenger train haulage in suburban areas. Much of this service is, however, performed by trains operating on the multiple-unit system, which offers certain advantages over the separate locomotive. The time has now arrived when the claims of the internal-combustion locomotive, which, like the steam locomotive, is a unit in itself, should be more carefully considered. At the present moment engines designed on this principle are in course of construction for passenger service abroad, whilst more than one firm of engineers has developed or is developing designs for internal-combustion locomotives specially intended for shunting work on railways, narrow gauge service of various kinds, also in the yards of industrial concerns, and indeed wherever the movement of railway vehicles has to be provided for as apart from the railway itself.

The characteristics of the internal-combustion locomotive as compared with that propelled by steam are fairly well known. Chief among the advantages claimed is the instant availability for service owing to the elimination of time spent in raising steam. It is true, of course, that engines working on the internal-combustion principle are sometimes difficult to start, and particularly so in cold weather, owing to the less ready vaporisation of the fuel charges. Those which use paraffin or heavier oil as fuel may, however, have their starting capacity considerably improved by the use of petrol for starting purposes, the change over from one to the other being effected as soon as the cylinders are warm, and certainly before the load is taken up, thus reducing the amount of petrol used and economising in the cost of fuel and saving valuable time. It seems practically certain that the oil locomotive will figure prominently in railway service in the future, and that it will find its way on to the standard gauge railways through the medium of the shunting yard where conditions are such that readiness for service and the elimination of stand-by losses are required. The use of oil as a fuel in place of coal in any case means greater cleanliness and ease of handling, and particularly so where the combustion of the fuel takes place inside the cylinder instead of in the firebox. Similarly, the avoidance of boiler troubles is worthy of attention.

There are two kinds of internal-combustion locomotives which lend themselves to service in the shunting yard, and also some other phases of railway operation—(1) that in which the engines are of the high speed vertical type using petrol as fuel; and (2) the low speed horizontal type having characteristics similar in some respects to that of the gas engine, and utilising a heavy grade of oil as fuel. Each is able to claim certain advantages, some of them being common to both when viewed from the standpoint of the conditions to be met by yard locomotives. It is not our purpose on this occasion to compare the one with the other, but

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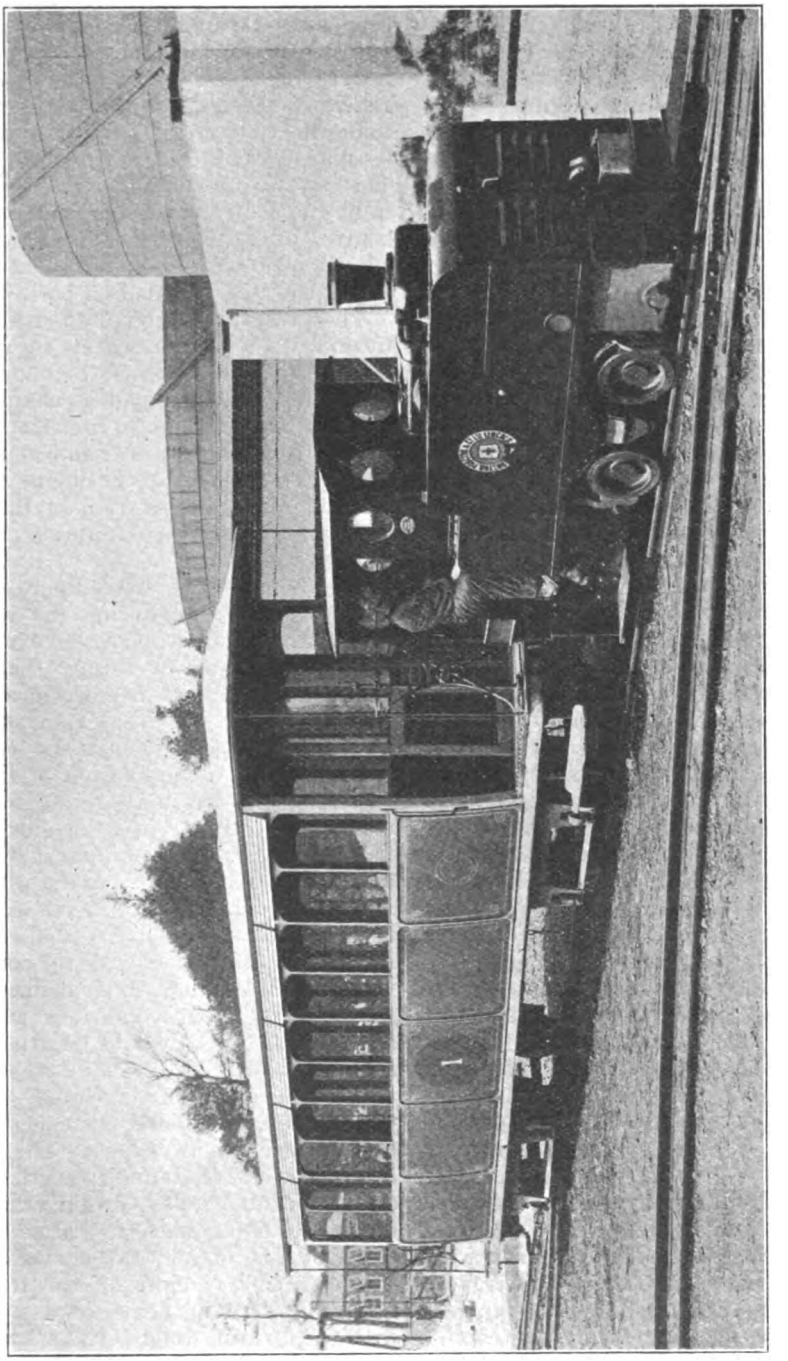

INTERNAL COMBUSTION LOCOMOTIVE ON WORKS PASSENGER SERVICE, 2-FT. 6-IN. GAUGE LINES.

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reference may be made to a notable example of the latter type, which develops power at low speed revolutions per minute and belongs to the class known as the heavy oil engine. In this type the necessary hauling and speed characteristics are achieved through the means of suitable gearing, in conjunction with heavy flywheels, the latter adding to the service flexibility of the locomotive, a point which is of vital importance in shunting work where many stops and re-starts have to be made, whilst the load varies from minute to minute. An engine of this class is enabled to stand prolonged vibration, and owing to its generally substantial construction, impacts received whilst shunting are not injuriously felt. It can also make extended runs at full power, whilst the range of fuels it is capable of using is a wide one. Another point worthy of mention as constituting an advantage is that, owing to the low crankshaft speeds, wear and tear are reduced, the results being seen in lower maintenance costs.

The locomotive illustrated was built at the Grantham works of Ruston and Hornsby, Limited. These locomotives have already given a very good account of themselves in service on light railways. So far they are not available for use on standard gauge lines, but the general design of the locomotive is such that it is only a matter of proportional development to make it suitable for heavy work on the 4 ft. 8½ in. gauge. The engines are made in two sizes, viz., 10 h.p. and 20 h.p., the first having a single cylinder and the second twin cylinders. They are ranked as 4 ton and 6 ton engines.

The 4 ton locomotive develops a constant draw-bar pull of 800 lb. and the 6 ton a draw-bar pull of 1,600 lb. at 3 m.p.h. The actual load hauled actually depends very much upon the frictional resistance of the rolling-stock and the condition of the track.

The engine is of the heavy horizontal type running at slow speed, and designed for use on petrol, paraffin, or kerosene oils. There are two speeds in both directions giving at normal engine revolutions travelling speeds of 3 and 6 m.p.h., but capable of a higher speed by increasing the revolutions per minute of the engine, and for this purpose a convenient control is provided. There are two exceptionally heavy flywheels giving greater flexibility and enabling heavy loads to be picked up with ease. Ignition is by high tension magneto with sparking plugs and variable trip gear for retarding the spark at starting and when working under exceptionally heavy conditions. The locomotive in its general outward appearance resembles somewhat closely a small steam tank locomotive built on narrow gauge lines. The coupling and buffing gear is designed to fit existing rolling-stock, and a powerful control brake is fitted, this operating on all rail wheels. Foot-controlled sanding appliances are provided on both sides.

The power of the engine is transmitted by machine-cut spur wheels through two clutch shafts and thence by chain to the rear axle. A second endless chain couples the rear and front axles, thus transmitting power to all four wheels and making the whole of the weight of the engine available for adhesion. Lubrication of the engine is effected by sight feed lubricators in the driver's cab.

The engines are exceedingly easy to handle and indeed during the war were frequently run by women who experienced no difficulty in operating them. The engine is fitted with a powerful governor which is very sensitive and adjustable for varying speeds while the engine is running. The manipulation of the gears is easily effected and gives the driver complete control of the locomotive. During the war one of these locomotives ran for a period of nine months and in that time cost only 40s. for overhauling and repair. The engines have been employed in powder factories and in connection with wood logging, thus demonstrating their safety under conditions where the emission of sparks would be attended by considerable risks. They are likewise being employed in limestone quarries, goods yards, and in passenger service on the 2 ft. 6 in. gauge. The 10 h.p. design has inside framing and the 20 h.p. outside framing, also certain other slight modifications to meet the altered conditions of the larger and heavier engine. The engines are light on the track and capable of moving heavy loads compared with their own weight. They represent an excellent example of oil locomotive design in all respects.

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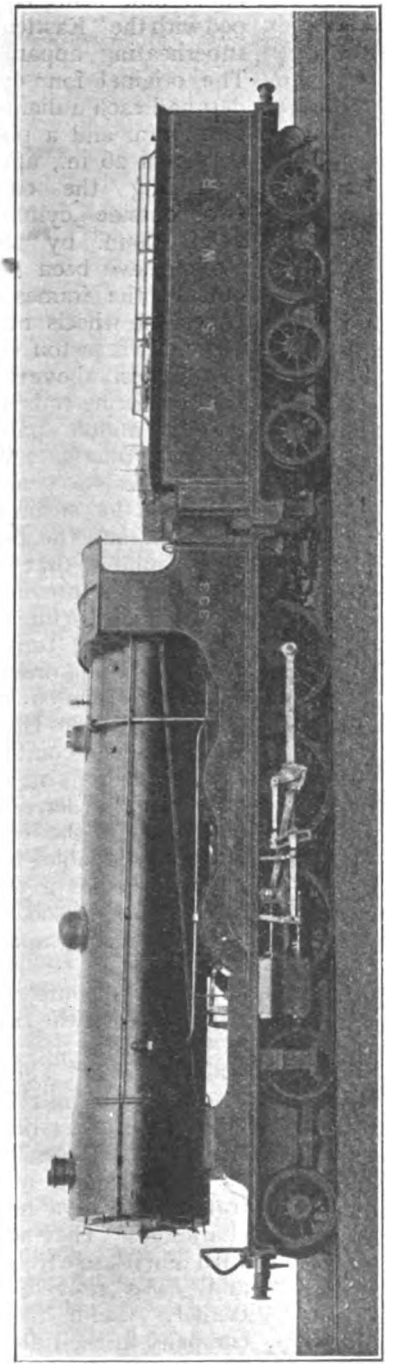
Rebuilt Locomotives, London & South Western Railway.



4-6-0 LOCOMOTIVE No. 333, AS REBUILT BY MR. R. W. URIE.

MR. R. W. URIE, Chief Mechanical Engineer, London and South Western Railway, has reconstructed several of the late Mr. Dugald Drummond's four-cylinder 4-6-0 locomotives of the earlier classes, in some instances converting them to two-cylinder engines, and two examples are now illustrated.

No. 333, which retains its four cylinders, was one of the first four-cylinder engines with the 4-6-0 wheel arrangement to be constructed by Mr. Drummond and built in 1905 as a mixed-traffic class. The two forward cylinders were placed between the frames for driving the crank axle of the leading coupled wheels, whilst the outside cylinders at the rear of the bogie drove the middle pair of coupled wheels, The cylinders are 16 in. diam. by 24-in stroke, and the coupled wheels 6 ft. diam. In rebuilding these engines the cylinders and motion have been left as before and the chief alteration consists in changing the character of the boiler, equipping it with superheating apparatus of the "Eastleigh" type, increasing the length of the smokebox, and fitting the new type of chimney. The extended part of the smokebox is supported upon a gusset plate. The boiler centre is set at 9 ft. above the rails and the boiler proportions generally are on the large size. The barrel has a length of 13 ft. 9 in. and a diameter outside the front of 5 ft. 6 in. The firebox is 9 ft. 6 in. long outside, 4 ft. 8 in. deep below the centre line of the boiler at the back end, and 4 ft. 11 in. deep at the front end.

Heating surfaces are: small tubes, 1,252 sq. ft.; large tubes, 464 sq. ft.; firebox flue tubes, 168 sq. ft.; superheater, 308 sq. ft.; total, 2,192 sq. ft. Grate area is 31·5 sq. ft., and steam pressure, 175 lb. per square inch. Weight in working order is now 73 tons 18 cwt. The engine is equipped with feed-water heating apparatus, the heating surface of the tubes in the tender well being 382 sq. ft. There are 65 of these tubes, each 1¼ in. diam. by 18 ft. long. Engine and tender in working order together weigh 118 tons

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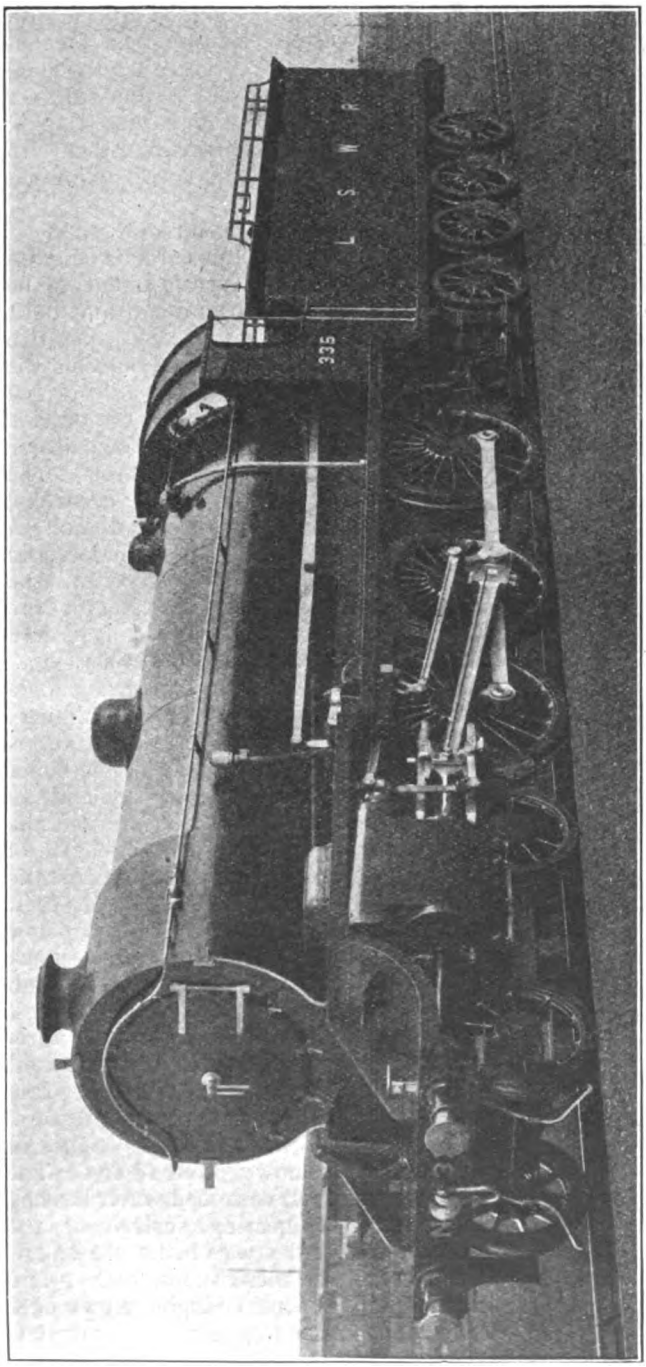
15 cwt. The water capacity of the tender is 4,000 gallons, and a fuel space for five tons is provided. Five engines, Nos. 330-334, are being rebuilt in this fashion.

The second illustration shows No. 335, the pioneer of the second series of Drummond four-cylinder 4-6-0's. In this case the engine has been converted from four cylinders using saturated steam to two cylinders using superheated steam, the boiler now being equipped with the "Eastleigh" superheating apparatus. The original four cylinders had each a diameter of 16½ in. and a piston stroke of 26 in., and in rebuilding the engine two outside cylinders, 21-in. diam. by 28-in. stroke, have been fitted outside the frames between the wheels of the bogie, with piston valve steam-chests above them, the connecting rods driving the middle pair of coupled wheels. Walschaert valve gear is employed for steam distribution, and the boiler is the same as that used in the engine previously described. Engine No. 335 weighs 79 tons 12 cwt. in working order, of which 58 tons 9 cwt. rank for adhesion. Engine and tender combined weigh 128 tons 12 cwt. in working order. The tender is of the eight-wheeled, double-bogie pattern. It has a water capacity of 4,500 gallons and a coal capacity of five tons.



4-6-0 LOCOMOTIVE No. 335, AS REBUILT BY MR. R. W. URIE.

The details are, to a large extent, the same as those of the 482 class built in 1914. The engines, since being rebuilt with superheater boilers and other features, have been performing mixed traffic work of a heavy character. They steam with remarkable freedom and have proved extremely useful to the company in their altered condition.

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The Yardmaster.

By C. V. MILLER.

THE efficiency of a marshalling yard varies to a great extent with its convenience and design. Many of the yards of this country have been ill-planned, or, like Topsy, "have just growed." It is a matter of great cost to re-design a large yard at the present time, and it is therefore more than ever important that full use be made of the available and perhaps inadequate facilities.

With a well-planned yard much depends on the man in charge of it, a fact which is often not sufficiently realised. A capable man will make a bad yard render good service, and a good yard better. It has been said that the difference between a good yardmaster and a bad one may amount to the salary of a general manager.

A yardmaster must be as full of resource, experience and initiative, as a "Nestlés Milk" cat is supposed to be full of cream. The writer has visited various congested yards, and has seen the yardmaster working at high pressure, never free to call his soul his own. It is only by action—consistent, persistent and insistent—that the congestion is relieved. Moreover, delay is fatal. Like a surgeon, a yardmaster must diagnose the trouble, and then *operate* and remove the cause. Often a faulty policy, vigorously pursued, is more satisfactory than a half-hearted one. A prominent transport officer once said that the kind of man required to run a big yard was the one who could run the Government.

A yardmaster can only be successful by the keen co-operation of his staff. Willing support and respect, ready obedience and confidence will only be given by a staff to a *competent* man who has the knack of handling men tactfully. The yardmaster must train his staff to run the yard without him, so that he may be free, to use the words of the late Mr. Harriman, to put his feet on his desk and *think* and *think*. Never must he get desperate and buckle to with a shunting pole, or at some minor clerical work.

At times he will probably be confronted with a blockage, and it must be remembered that a blocked yard is an expensive tool lying idle, and generally means costly delays on the running roads. It is very difficult to withstand the appeals of officials and traders, and to avoid giving preferential treatment to any traffic. The time wasted hunting up scattered wagons may cause an indefinite and a needless further congestion.

In the words of the popular fox-trot, everything must "Keep moving," and it is the business of the yardmaster to see that nothing stagnates. He must see that no traffic is allowed to "grow old" at the back of a dead-end road. Yard tidiness is important. Trucks for odd destinations in the wrong roads always breed trouble, and time is wasted in sorting them out, beyond all proportion to the services rendered.

The yardmaster must always be endeavouring to operate his yard more efficiently, and to do this he should study closely any comparative statistics which can usefully be compiled, daily, monthly or annually, striving to improve his average for the ensuing period, and seeking explanations and remedies for his set-backs. Among the most important are:—statements of engine hours, engine hours idle, cost per wagon entering yard, staff employed, overtime earned, late departures and causes, &c.

Much can often be done by the yardmaster in putting forward suggestions for extra facilities when likely to effect an improvement, such as a new cross-over, a new water crane, an altered signal, or a re-arrangement of ladders.

It is only too easy to become deadened to fault by countenancing it for sufficiently long. The yardmaster must guard against this, and keep reviewing his traffic-handling organisation, to see that the best results are obtained in the cheapest and most efficient manner.

No yardmaster should rest content till he was sure that the organisation of his personnel was as perfect as he could make it, and he should endeavour to keep it so.

It is difficult to compare the results

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obtained in two yards. Success in one may be caused by congestion in another. A well-designed yard is in a better position than an ill-planned one. It is well to remember this, when passing judgment on the yardmaster. Too often has the wrong man received credit and kudos for what he did not deserve, while the deserving man gets the blame.

Let the yardmaster remember Kipling's well known words :—

"If you can keep your head when all about you
Are losing theirs and blaming it on you :
If you can trust yourself when all men doubt you
But make allowance for their doubting too ;
. . . . . .
If you can fill the unforgiving minute
With sixty second's worth of distance run,
Yours is the Earth and everything that's in it,
And—which is more—you'll be a man, my son."

THE RAILWAY YEAR BOOK, 1921.

London : Railway Publishing Company Limited, 30, Fetter Lane, E.C.4. 400 pages. Price 5/- net, by post 5/9.

THIS valuable railway reference work is now published for the 24th consecutive year, and consists of a larger volume than any of its predecessors. It contains much that is new, and the book, as a whole, deals comprehensively with the railways of the British Empire and foreign countries where British capital and enterprise are prominently concerned. In short, it includes complete information of all the essentials of the railway industry.

The home railways section of the book has received very extensive revision and improvement. Here are now presented facts and figures relative to the rolling-stock and equipment, passenger and goods traffic, mileage, &c., of 52 railways, in addition to the customary historical sketches, many of which have been re-written and now include much more reference data than in former editions. The Londonderry and Lough Swilly, one of the longest and most important of the Irish narrow-gauge railways, is thus dealt with in detail for the first time. An entirely new historical sketch replaces that hitherto given of the Midland and Great Northern Joint Railway, and a map of this important joint line is now given. The book contains 44 maps.

Statements are included of the Government proposals for the grouping of railways, and the alternative scheme put forward by the Railway Companies' Association. A general review is provided of the recent report of the Rates Advisory Committee to the Ministry of Transport.

A feature which will doubtless be appreciated in certain quarters is the introduction of a comprehensive bibliography devoted to railway history finance, operation and engineering—civil, mechanical and locomotive. The books are classified and the date of publication and the name of publisher are furnished. Another innovation is a diagram showing how the tare weights are indicated on the passenger rolling-stock of the leading British lines.

The section devoted to colonial and foreign railways has been revised, and particulars of the Ottoman and Mesopotamian Railways introduced. In the biographical pages, numerous alterations appear, due to death, retirements and promotions ; the new biographies are unusually numerous. The new organisation affecting the railways of the London "Underground" group is fully set forth.

The practical reader will be glad to note the extent to which this new edition provides information as to the adoption of the Control system by railways, also facts concerning the principal locomotive depôts, the indications borne by engines attached thereto, and the positions where these appear.

As in former years space is devoted to institutions, associations, societies and clubs concerned with railways and railway working and engineering. This year, there are several societies appearing for the first occasion. In regard to the Ministry of Transport, effect has been given to the extensive revision necessary by the important changes and reductions that became effective as from April 1. Further evidence of the down-to-dateness of the book is the inclusion of the official announcement, dated March 24, of the proposed amalgamation of the London and North Western and the Lancashire and Yorkshire Railways.

To all to whom reliable railway facts and figures are a necessity, the Railway Year Book is an indispensable volume.

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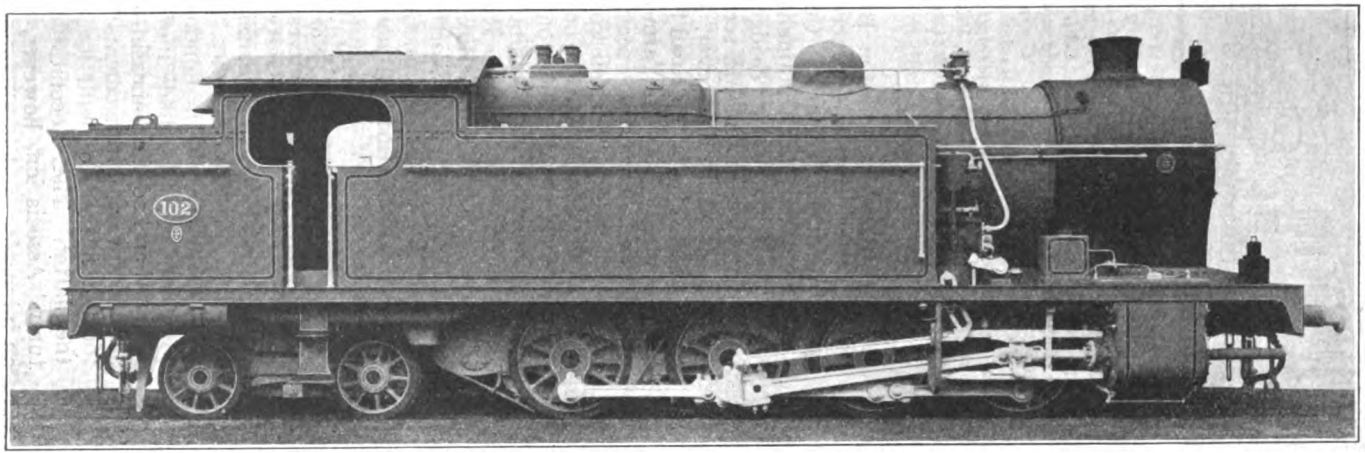
0-8-4 TANK LOCOMOTIVE, GREAT INDIAN PENINSULA RAILWAY.



FOR operating trains over the "Ghat" sections of the Great Indian Peninsula Railway, powerful 0-8-4 tank engines have for several years been used for working over gradients of 1 in 37, in some cases for considerable distances. The locomotive illustrated is one of the latest series, built by the North British Locomotive Company Limited. The design includes Belpaire firebox, top-feed, Weir feed pump, oil fuel fittings, superheater and Wakefield mechanical lubricator with anti-carboniser.

LEADING DIMENSIONS.

Gauge	5 ft. 6in.	Heating surface—Tubes	1,552 sq. ft.
Cylinders	22 in. by 26 in.	Firebox	174 sq. ft.
Cylinder wheels	4 ft. 3 in. diam.	Superheater	383 sq. ft.
Bogie	3 ft. diam.	Total	2,159 sq. ft.
Steam pressure	160 lb. per sq.in.	Grate area	32 sq. ft.

Adhesion Weight, 79¾ tons; total weight in working order, 103¼ tons.

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Railway Magazine *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* **Railway Magazine**, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," the twenty-third Annual Edition, published in April,* 1920, *is out of print, but a new one is in preparation, in readiness for publication in April,* 1921

Pullman Cars.

These are the private property of the Pullman Car Company, run by arrangement with the various railway companies. The staffs of the cars are employees of the Pullman company and not of the railways. This applies to third as well as first class cars, and where no supplement is charged, as on some of those on the Caledonian Railway, the matter is one of special arrangement—the cars are run in place of restaurant cars which would otherwise be provided by the railway company. The type of vehicle is based upon that originated and developed by the Pullman Car Company of America, though most of those used here have been built in the United Kingdom. They are privately-owned vehicles, providing *de luxe* accommodation, additional to whatever the railway company may itself supply. In the United States a large number of the special cars are thus operated, but in this country such methods are still exceptional, though gradually extending. Our restaurant cars are not in any sense "Pullmans," though the term is also used for cars embodying the Pullman methods of design and construction, which have not been adopted here, except by the company itself.

[Reply to J. D. Thomson.]

Single Line Sections, Midland and Great Northern Joint Railway.

Peterborough—Sutton Bridge section: Thorney to Murrow, and Horse Shoe Lane (Wisbech) to Sutton Bridge Junction. Little Bytham Junction—Sutton Bridge section: Twenty to Cuckoo Junction (Spalding) and Cunningham's Drove (Spalding) to Sutton Bridge Junction. Sutton Bridge—Yarmouth section: Over Sutton Swing Bridge, over West Lynn River Bridge, Grimston Road to Raynham Park, and Corpusty to Yarmouth. Yarmouth and Lowestoft section: Over Breydon Viaduct. Melton Constable and Norwich section: Melton Constable East to Norwich North. Melton Constable and Cromer section: Briningham Junction (Melton Constable) to Runton West Junction, Cromer Yard Box to Cromer Station. Cromer and North Walsham section: Newstead Lane Junction (Cromer) to Antingham Road Junction (North Walsham).

[Reply to A.R.M.]

When the London and North Western Railway built locomotives for the Lancashire and Yorkshire Railway.

Partly due to the probability of amalgamation in the 'seventies, but also in view of the fact that the London and North Western Railway had more complete works than had the Lancashire and Yorkshire Railway, arrangements were made for the former to build locomotives for the latter. The Locomotive Manufacturers' Association, however, applied for an injunction, and in all subsequent Railway Bills, action of this kind has been prohibited. The question also arose when proposals were on foot, in 1908, for the

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amalgamation of the Great Northern and Great Central Railways.

[Reply to R.H.]

Maximum Speeds.

Provided that a driver is not "easing" his engine, owing to being before time, or other reasons, you may expect to attain the maximum speed below St. Alban's on an up Midland express, at a point 1 mile north of Radlett. Average speeds of up and down expresses on the Great Western Railway at Southall and West Drayton may be taken at from 60 to 65 m.p.h., or slightly more, although it is difficult to state a precise figure. Why not read Mr. Cecil J. Allen's monthly articles on "British Locomotive Practice and Performance," where these matters are gone into in detail?

[Reply to A. JOHNS.]

Corridor Coaches.

It is impossible when running vehicles on the railway to ensure that they do not sometimes get "turned" by travelling over triangular junctions, or getting reversed in terminal stations, or by other means, especially on such a line as the Great Western, which has many cross-country routes. In consequence, vehicles will be found in almost any corridor train with the corridors on opposite sides of the coaches. It is for this reason that the central end gangway is adopted, even though it involves the sacrifice of a certain amount of space at the ends of the coaches.

[Reply to "CORRIDOR."]

Distant Signals at Terminal Entrances.

These are provided in cases where there are intermediate signals controlling progress along a terminal platform, as when one train can be brought up behind another, or when vehicles are liable to be left at the ends of platform roads. Their indication is therefore that only part of the platform is clear. In practice, however, such distant signals are seldom or never used, and in some cases they are fixed; but they serve as a continual reminder to enginemen that they may not be able to proceed the entire length of the platform.

[Reply to E. L. ORMEROD.]

Mail Trains, Caledonian Railway.

The only trains on this railway conveying Post Office sorting tenders are the West Coast Postal expresses between Euston and Aberdeen (with through connections in each direction between London and Glasgow and Edinburgh, and Glasgow and Aberdeen). The down train leaves Euston at 8.30 p.m. and Carlisle at 3.23 a.m., reaching Edinburgh at 5.55 a.m., Glasgow at 6.5. and Aberdeen at 8.45 a.m.; in the up direction the departure times are 3 p.m. from Aberdeen, 6.15 p.m. from Glasgow, and 6.20 p.m. from Edinburgh.

[Reply to ALEX. W. ANDERSON.]

Platforms "On Either Side."

This system is by no means entirely advantageous. It materially increases constructional costs at stations, and not only so, but the cost of operating also, as the platform staffs must be doubled. Further, it in no way curtails the time of detrainment and entrainment at stations on tube railways if the coaches have end exits only. We do not know of the principle being in any extensive use in other countries, and it is obviously impossible for us to forecast future developments in this country.

[Reply to "PERTINAX."]

Platform Tickets.

We understand that these were first introduced at Taunton, Wellington and Wolverhampton on the Great Western Railway, and that Victoria station, Manchester, Lancashire and Yorkshire Railway, was the first of the great stations to instal platform ticket machines. Previously, however, several railways had, at times, or even regularly, as we believe at Crewe, controlled access to stations by others than passengers by the issue of tickets by the collectors, but without charge.

[Reply to "PERTINAX."]

Gradients, London, Brighton & South Coast Railway.

A profile of the main line from Victoria to Brighton, via East Croydon, appeared in Mr. Cecil J. Allen's article in the September, 1915, issue, page 211; the principal gradients on the same route are also mentioned in his article in the current issue. We do not know of the profile of the Balham-Crystal Palace section having been published. Your other query as to dimensions contravenes the rules.

[Reply to "STREATHAM."]

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A Great Western Railway Locomotive Query.

No engine of this railway has ever to our knowledge borne the name "Herchelles." There is, however, a 4-4-0 engine, No. 4123, named "Herschell." It is quite impossible for two different engines of the same company to bear identical numbers, though there may be a corresponding "A" or "O" engine on the duplicate list, and in some instances an underline or cancelling line is added to the old number to differentiate the duplicate from its successor.

[Reply to A. R. HARRISON.]

Signalling at St. John's, South Eastern & Chatham Railway.

We do not understand your difficulty. From your sketch each box has its correct home signals; but some of these appear to be slotted by adjoining boxes and certain signals may rank at the same time as the home of one box and the advanced starter of another, a situation which frequently happens when boxes are so close together. The question of inner and outer home signals does not seem to arise.

[Reply to H. A. POPER.]

Portsmouth Service, London & South Western Railway.

Since the completion of the electrification to Claygate, it has doubtless been found more convenient, from the systematic working point of view, to divert the expresses from the pre-war Claygate route back to the main line *via* Woking. No definite speed orders are in force at the points you mention, other than the usual rule as to careful running through junctions.

[Reply to J. D. THOMSON.]

"Fireless" Locomotives.

The principle of these is that if a boiler is filled with water and steam at a high pressure, usually about 250 lb. per sq. in., for the ordinary works engines of this class, the reduction of pressure for work at about 80 or 100 lb. per sq. in. releases heat which causes the evaporation of further water to keep up the supply of steam within the available capacity.

[Reply to T. J. PARRY.]

Fishplates.

Referring to the reply already given, Mr. F. J. Buckley writes: Sir John Wolfe Barry, in his little work "Railway Appliances," states that "the object of the fish joint (which derives its name from the nautical term 'fishing,' for mending a broken spar by lashing timber on each side of it), is that it should be impossible for one rail to rise above the other . ."

[Further reply to CHARLES HAMMOND.]

Continental Trains, South Eastern & Chatham Railway.

These trains from and to Victoria are routed according to traffic convenience, travelling either via Chatham and Faversham, Brockley and Orpington, and sometimes via the Catford loop line. Where several parts are run, they may not all take the same route; while the frequent changes of times for these trains may involve altered routes.

[Reply to J. WROTTESLEY.]

Domeless Boilers, Great Western Railway.

Steam is collected in these boilers by means of a perforated pipe arranged cross-wise in the top front corner of the large fire-box, which contains an ample steam space above the water level. The curious appearance of the Great Western Railway safety-valve is due to the pipes of the top-feed apparatus, wherewith water is fed into the boiler, leading up into the casing on either side.

[Reply to G. S. HACK.]

Boilers.

Seeing that steam pressure is cumulative when it is being generated in a sealed vessel, a limit is bound to occur at which any boiler, no matter what its construction might be, could no longer withstand the pressure, and would burst, if the steam had no safety outlet. Obviously boilers are designed to sustain, safely, pressures considerably higher than the pressure at which the locomotive is worked.

[Reply to A. C. WADE.]

Corridor Stock, South Eastern and Chatham Railway.

You are correct in stating that vestibuled corridor coaching stock is now under construction at Ashford for this railway. These coaches are to be vestibuled to the Pullman cars on the Flushing boat express trains, in order that second as well as first class passengers may have the opportunity of taking meals on the cars.

[Reply to "No. 4 Shed."]

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Distant Signals at Night.

Except for the use of illuminated fish-tails, as on several railways, or by the use of yellow lights for the "on" position, no means are provided for distinguishing distant from stop signals at night. A driver must, however, be well acquainted with all signals, so that lack of distinctiveness is not a serious matter, though differentiation is desirable.

[Reply to F. J. BUCKLEY.]

4-6-2 Tank Engines, London and North Western Railway.

No new engines of this type have been built recently. Those now working on the Manchester-Buxton service have been transferred from other sheds. The pipes leading from the tanks above the coal bunker are air outlets for the water-pick-up apparatus in the case of the engines fitted with the latter.

[Reply to N. B. PORRITT.]

Fixed Distant Signals.

These are made use of to a certain extent by almost every railway company, but they are more common on some lines than others. The true "fixed" distant signal is one without any connection by wire to the signal-box; the arm is actually fixed in position, and a lamp is used at night with a fixed red spectacle.

[Reply to CHAS. V. YOUNG.]

4-6-0 Engines, Lancashire and Yorkshire Railway.

We know of no intention on the part of this company to build further engines of this type after the rebuilding of the existing 20 is complete. According to later information, we now understand it is not the present intention to rebuild the "Atlantics."

[Reply to L. PATCHETT.]

"Claughton" Class Engines, London and North Western Railway.

Maximum speeds attained by these, as by most other express engines, vary considerably according to circumstances too numerous to enumerate here. For details of the running of these engines read Mr. Cecil J. Allen's article in the April RAILWAY MAGAZINE.

[Reply to H. S. HACK.]

Light Railways.

We are advised that the Light Railway Commission has still a separate existence in the same sense as before, the only difference being that they are now associated with the Ministry of Transport as the confirming authority, instead of with the Board of Trade. In conjunction with our previous reply this will make the situation quite clear.

[Further reply to R. MOSELEY.]

Elephant Vans.

Several railways have vans specially designed for the conveyance of elephants, as when circuses travel, or if these animals are landed from overseas at one of the ports. Fancy names are adopted on the Great Western Railway for distinguishing special classes of vehicles, and "Pythona" is one of these titles.

[Reply to S. F. OLDLAND.]

Colours of Locomotives and Rolling-Stock.

Grey was adopted as the livery of Great Eastern Railway locomotives early in the war period, and so far has been continued, as being cheaper and involving less work. Lake became the standard colour for passenger carriages on this line when normal work was resumed after the armistice.

[Reply to C. G. M. MACGREGOR.]

Ambulance Trains.

Coaches composing such of these trains as have been taken back into stock by the railway companies have now in most cases been converted into ordinary corridor stock. Your other query deals with a matter of opinion, whereas these columns are intended to deal with matters of fact.

[Reply to A. GROUND.]

Longest Pre-War Run, Caledonian Railway.

From Carlisle to Perth, 150¾ miles, was the longest run shown in the public time-tables, but in practice the almost invariable stop at Beattock for water and assistance reduced the length of the non-stop journey to 111 miles.

[Reply to ALEX. W. ANDERSON.]

Wood Green Tunnel, Great Northern Railway.

Speed restriction on express trains through this tunnel will doubtless be taken off when the repairs are completed. The average speed at which up fast trains enter Oakleigh Park tunnel may be taken at between 65 and 70 m.p.h.

[Reply to A. F. H. BRISCOE.]

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Great Western Railway Locomotives.

We believe the three old 2-4-0 engines you mention—Nos. 154, *Chancellor*; 73, *Isis*; and 74, *Stour*—are still at work. The three French 4-4-2 compounds generally work on the northern main line services, but they could be used on most, if not all, sections.

[Reply to "LADY OF QUALITY."]

Train Indicator in Box.

This notice, affixed to a signal box. indicates that the presence of a waiting train is protected by track circuit or rail contact and that it is not necessary for the fireman to proceed to the signal cabin as required by Rule 55.

[Reply to H. C. B. HILL.]

"Southern Belle" Pullman Cars.

First-class cars average in weight 40 to 42 tons, and third-class cars 32 tons, on this train. First-class cars measure 64 ft. over buffers. Accommodation of the cars varies considerably according to type.

[Reply to H. T. HOBBS.]

Great Western Railway 4-4-0 engine No. 3555.

We believe this to be one of the old "Stella" class rebuilt by Mr. Dean from 0-4-4 tank engines. These have 5 ft. coupled wheels. Perhaps other readers may be able to confirm.

[Reply to H. T. HOBBS.]

Morley Tunnel, London and North Western Railway.

Single-line working has been in force since the end of November, 1920, through this tunnel, and will probably be continued for three or four years, during the re-lining of the tunnel.

[Reply to "T. T."].

Electric Working, London, Brighton and South Coast Railway.

Your remarks are noted with thanks, but in any case electric working between Streatham Common and Selhurst is very exceptional, and does not occur in regular services.

[Reply to J. M. KUKLY.]

Diggle to Mirfield.

Four running roads exist on the London and North Western Railway from Diggle to Heaton Lodge Junction, and thence over the Lancashire and Yorkshire Railway to Mirfield.

[Reply to J. ALAN RANNIE.]

"Train Coming" Indicators.

It is not clear what devices you refer to, but "annunciators" operated by the signalman are in several cases installed to advise the staff that a train is approaching and to indicate the line upon which it is running.

[Reply to PERTINAX.]

Locomotive Restrictions, London & South Western Railway.

Restrictions on the working of the large 4-6-0 engines beyond Dorchester is that they are too heavy for certain Great Western Railway bridges between there and Weymouth.

[Reply to J. R. B.]

Single Line Branches, Lancashire and Yorkshire Railway.

Other than the Clayton-Meltham, Rishworth and Holcombe Brook branches, the only single line section is the Facit branch from Wardleworth. We understand that the Tarleton branch is in use.

[Reply to J. E. SHAW.]

"J" Class 4-2-2 Engines, North Eastern Railway.

These engines are in course of being broken up, and their numbers are being taken by new 4-4-4 tank engines of Class "D." We do not quite understand your second query.

[Reply to D. W. ALLEN.]

Head Codes, South Eastern and Chatham Railway.

It would require much more space than we can spare to set forth the lamp and disc head-codes used on the South Eastern and Chatham Railway.

[Reply to G. N. LUGG.]

Rebuilt Lancashire and Yorkshire Railway Locomotives.

Your notes concerning these engines are covered by Mr. Allen's remarks in regard to them elsewhere in this number. Your good wishes are much appreciated.

[Reply to J. A. E. JAMES.]

South Eastern & Chatham Railway Locomotive No. 815.

This new 2-6-0 engine differs from others only in that one dome cover is provided in connection with the top feed arrangement, and the other for steam collection.

[Reply to P. HEATH.]

4-6-4 Tank Engines, Midland Railway.

No engines of this wheel arrangement have been built at Derby Works. Those

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now running were built by Messrs. Beyer, Peacock and Co., for the London, Tilbury and Southend section.

[Reply to C. S. ORPEN.]

Cambridge to Haughley, Great Eastern Railway.

Except for about 1 mile between Newmarket and Warren Hill, where the railway tunnels under Newmarket Heath, this route is double line throughout.

[Reply to A. P. MIALL.]

Furness Railway Main Line.

This is all double line except the short section from Sellafield to St. Bees, near Whitehaven. The branches are all single except the avoiding line to the east of Barrow.

[Reply to A. P. MIALL.]

4-6-0 Locomotives, Great Eastern Railway.

These locomotives work to Cromer, Norwich and Yarmouth, but not, unless exceptionally, on the Great Northern and Great Eastern Joint line.

[Reply to "GAINSBOROUGH."]

Train-Stopping Boards.

The large figures you have noticed on certain London and South Western Railway platforms denote where the drivers of eight-car electric trains should pull up.

[Reply to E. L. ORMEROD.]

Engine No. 1914, London and North Western Railway.

"Renown" class 4-4-0, No. 1914, *Invincible*, was renumbered 1257 when "Claughton" class 4-6-0 *Patriot* received this number in 1920.

[Reply to C. E. T. J.]

London and North Western Railway Locomotive Lists.

We know of no locomotive list in connection with this railway other than the one you mention, which is at the moment out of print.

[Reply to A. R. HARRISON.]

Situations on Railways Abroad.

So far as we know, it is very rarely, if ever, that such grades as firemen are advertised for on foreign or Colonial railways.

[Reply to A. MARLOW.]

New Great Northern Railway Locomotives.

Further 2-6-0 and 2-8-0 locomotives are under construction for service on this line, but we cannot say how many are contemplated.

[Reply to S. H. CROCKETT.]

London & North Western Railway Locomotive Lists.

Space cannot be spared to repeat information which has appeared in the RAILWAY MAGAZINE so recently.

[Reply to W. H. W.]

Restaurant Cars on 11.40 a.m. ex-Birkenhead, Great Western Railway.

This car is detached at Wolverhampton and works forward as a dining car to London on the 5.28 p.m. express.

[Reply to J. ALAN RANNIE.]

Boiler Feed, Great Western Railway.

Boilers were fed on the centre-line in the usual manner on this railway before the introduction of top-feed apparatus.

[Reply to "LADY OF QUALITY."]

"P.W.R." Checks.

An abbreviation used to denote reductions of speed on account of permanent way relaying or repairs.

[Reply to HARRY DAVENTRY.]

Ongar Branch, Great Eastern Railway.

There is only one section from Epping to Ongar, and the ordinary train staff is employed for controlling single-line working.

[Reply to H. A. POPER.]

Birkenhead--Bournemouth Expresses.

These trains travel between Oxford and Eastleigh *via* Didcot, Reading West and Basingstoke.

[Reply to A. SIMPSON.]

Private Owners' Wagons.

These are generally the private property of the owners whose names they bear.

[Reply to A. C. WADE.]

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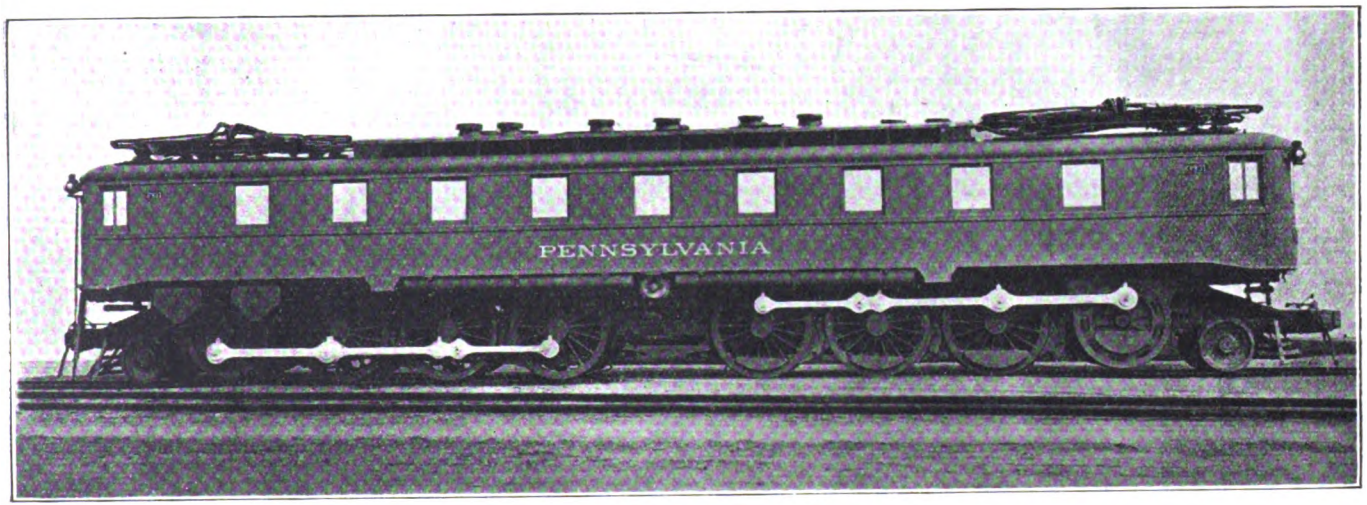
2-6-6-2 ELECTRIC LOCOMOTIVE, PENNSYLVANIA RAILROAD.



THESE powerful locomotives, known as class FF 1, are designed to operate on 11,000 volts, single-phase, 25-cycle current, collected from overhead conductors. Four motors, each of 1,200-h.p., are employed, two on each truck being geared to a jack-shaft which actuates the coupled wheels through connecting rods. A special spring transmission is used to give the effect of a solid gear from motors to jack-shaft up to a tractive effort equal to 25 per cent. of the weight on the drivers. Normal speeds are 10·3 and 20·6 m.p.h. Leading dimensions are: Over-all length, 76 ft. 6¼ in.; total wheelbase, 63 ft. 11 in.; rigid wheelbases, 13 ft. 4 in.; diameter of driving wheels, 6 ft.; weight on driving wheels, 198 tons; total weight, 240 tons.

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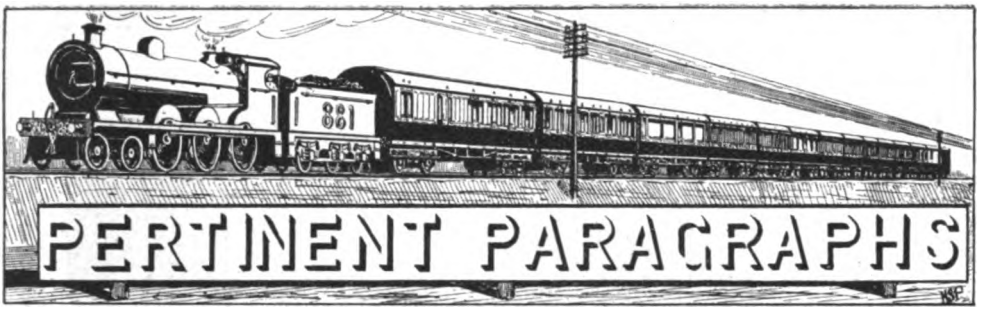

Fish Traffic by Rail.

In November, 1919, a Departmental Committee was appointed to consider the wholesale food markets of London, and a report has just been issued dealing with the fish markets. A number of well-known public men were members of the Committee, but only one railway officer, Mr. John Wardle, Commercial Manager, Metropolitan Railway. The report brings out many interesting details of the fish traffic dealt with at Billingsgate Market. A table is given showing the distances to Billingsgate Market from the various stations and the quantities of fish carted from each during the 12 months ended September 30, 1920. Of the total gross tonnage, 258,391, 141,608 tons were carted distances of from 2½ to 4⅞ miles. "The tonnage handled at Mint Street, the nearest station to Billingsgate Market, namely, 23,382 tons, would naturally, if a more convenient site could be found, be worked from King's Cross." The remaining deliveries of importance are 51,523 tons delivered at Bishopsgate and Liverpool Street, and 34,771 tons delivered at Broad Street. These stations are approximately about one mile distant from Billingsgate. A suitable site for a proposed central market is suggested as one in the area between Holborn and the Euston Road, whereby 97 per cent. of the rail-borne traffic could be excluded from the highly congested city area while not being too distant from the Great Eastern and London & North Western stations.

Apparently the main report was prepared in October last, though not published, and contained some severe strictures on the railway arrangements; but these are nullified by a supplementary report dated February of this year, admitting that most of the drawbacks set forth then had been remedied, and that delays by rail are now far less serious. This report states:—"Fresh evidence taken by us in February, 1921, from representatives of the London Fish Trades' Association, on behalf of the London wholesale merchants, and of the National Fish Trades' Association, on behalf of the retailers, shows that great improvement has taken place in the train services, and that there is now very little ground for complaint either as regards the adequacy of the services or the punctual running and arrival in London of the trains from the various ports. Both witnesses pointed out that difficulties which still remain are due to abnormal or seasonal catches, but they agreed that the railway companies are providing all reasonable facilities within their power to meet such exceptional traffic. It is important to note in this connection that the railway companies are now being called upon to deal with quantities of fish considerably in excess of those normally handled by them in the period preceding August, 1914."

In the main report the opinion is expressed that regular and speedy fish trains, composed of covered wagons of a suitable type, should be booked to run at such times as will permit of the fish arriving at its destination sufficiently early in the morning to admit of the whole trainload reaching the market in good time. It is recommended that (*a*) the railway service for inland conveyance of fish from the principal ports should be organised and run to scheduled times in accordance with the exigencies of the wholesale market; (*b*) the provision of suitable wagons should be strengthened; and (*c*) the stock of suitable fish wagons should be definitely allocated between the principal ports of collection and delivery, which should be specified, and these wagons should not be detached for any other purpose. In large measure these represent only the development of methods and practices already in more or less general use under pre-war conditions, and which are rapidly being restored.

Handling Exceptional Traffic.

Railway companies are often called upon to convey loads of an exceptional and awkward character, and sometimes this involves special measures during a journey owing to out-of-gauge dimensions or extreme weight. An interesting view is reproduced on the

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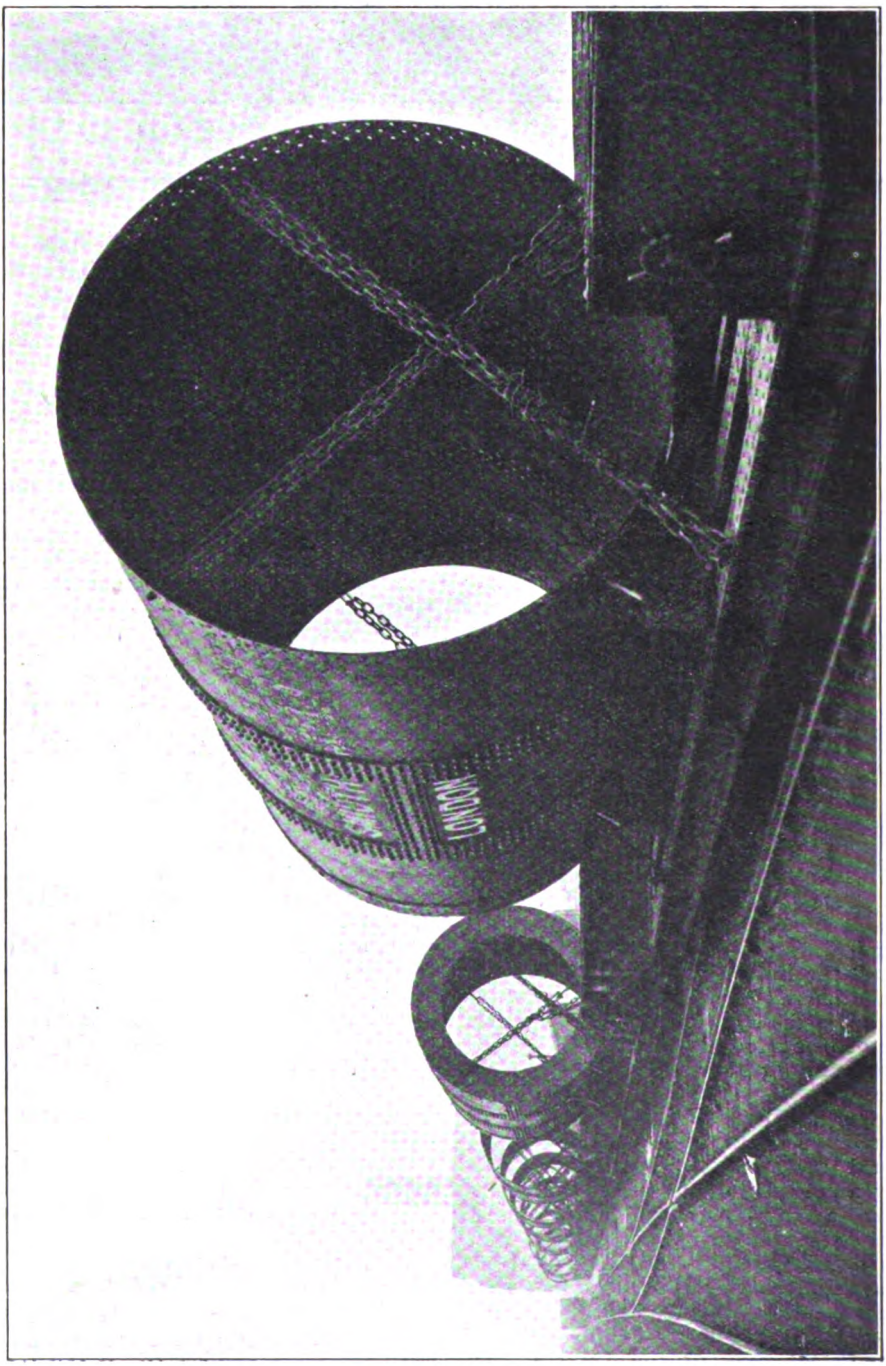

ONE OF THREE SPECIAL TRAINS CONVEYING ROTARY KILN SECTIONS FROM MANCHESTER TO DARTFORD.

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opposite page showing one of three special trains recently forwarded from Ardwick, Manchester, to Dartford by the London & North Western and South Eastern & Chatham Railways. The trains conveyed sections of kilns, to be used in the manufacture of cement, made by Messrs. Galloways of Manchester, and forwarded for the use of the Kent Portland Cement Company. These rotary kiln sections varied in length from 12 ft. to 18 ft. 10 in., their overall diameter being 10 ft. 4 in., and average weight 9 tons 17 cwt., whilst the heaviest section weighed 12 tons 7 cwt. The conveyance of 10 pieces with dimensions so much in excess of the normal in one train is believed to constitute a record in the conveyance of exceptional traffic for British railways, and one of the initial difficulties was to collect an adequate number of vehicles suitable for the transit. The illustration clearly shows the method of securing each section in place, and it will be observed that by the means adopted any increase in the width of the load was entirely avoided, as the chains attached to eyebolts were passed through the interior of the cylinders. Notwithstanding this restriction of the size of the loads to the bare measurements of the articles themselves, the adjoining lines had to be kept clear of all other traffic while the "specials" were in progress, and conveyance had to take place, as usual in such cases, on Sunday. On the first occasion unexpected developments occurred on the way up to London and absorbed more than the time allowed, with the result that the prearranged Sunday service over the South Eastern & Chatham Railway was missed. The loads had thus to be held up *en route* for a week. On the two subsequent journeys all difficulties were surmounted, the time-table was adhered to, and a clear run from sending points to destination was obtained.

Track Gauge and Loading Gauge.

SEVERAL readers have written in regard to newspaper comments on the recent trials of a Great Western Railway 2-8-0 locomotive on the North British Railway between Dunfermline and Perth. A *Daily News* writer in "Under the Clock," appears to be the principal sinner due to his incorporating remarks about the standard gauge of 4 ft. 8½ in., when the issue in question was really loading gauge and weight. Obviously the engine could have travelled from Swindon to Scotland by a score of routes had the rail gauge only been in question. In fact, it would not have been in question at all, seeing that only on narrow gauge lines is there anything other than the standard. The loading gauge, however, introduces the factors of width and height, and the principal difficulty was that these are more liberal on the Great Western than on most other lines. Thus, referring to the loading gauge diagrams published in the RAILWAY YEAR BOOK, on most of the principal lines the width must not exceed 9 ft., though a few allow 9 ft. 3 in., but on the Great Western Railway the maximum is 9 ft. 8 in. Certain railways also limit the height to 13 ft., though in this case some lines permit 13 ft. 9 in., as compared with the Great Western 13 ft. 6 in. In many places, too, even the standard maximum dimensions are not available; but the main difficulty was probably that the weight of the engine exceeded the permissible maxima over certain bridges or key sections. It was for these and similar reasons that the engine had to be sent empty and with rods down, and not from any question of rail gauge, and the confusion of thought which has so perturbed some of our readers must be attributed to the loose way in which the matter has been treated in certain sections of the lay press.

A Proposed Automatic Electric Freight Railway.

IN connection with a large improvement scheme for the port of New York a novel type of automatic railway for freight exchange is proposed. One feature of the scheme is a system of belt lines linking up the New Jersey railways with additional terminals in Manhattan, and a joint yard in New Jersey, near the Erie Railroad yard at Croxton. This joint yard will also be the starting point for the automatic electric subway system. Passing from the classification yards of the various railways, standard cars will be transferred *via* the belt lines to the joint yard, whence they will be shunted from the reception sidings to tracks alongside long transfer platforms. Twenty-four of these are proposed, each having on one side a standard track and on the other an automatic electric track. Freight will first be unloaded from the standard cars and placed upon small trailers adapted either to be hauled by tractors or by hand along the platform and placed in cars on the automatic-electric track. These latter cars are to be of box type, with a protecting roof, but with roll sides, so that the small trailers can be wheeled thereon at any point. The general practice will be that each car is destined for a particular terminal or reserved for freight to be handed over to a particular railway, and adapted so that 12 of the small platform trailers with their loads can be placed upon each. As soon as a complete load is made up the transfer car will be started by means of a switch within reach of an operator on the platform, and allowed to travel under automatic control at slow speed on to a track

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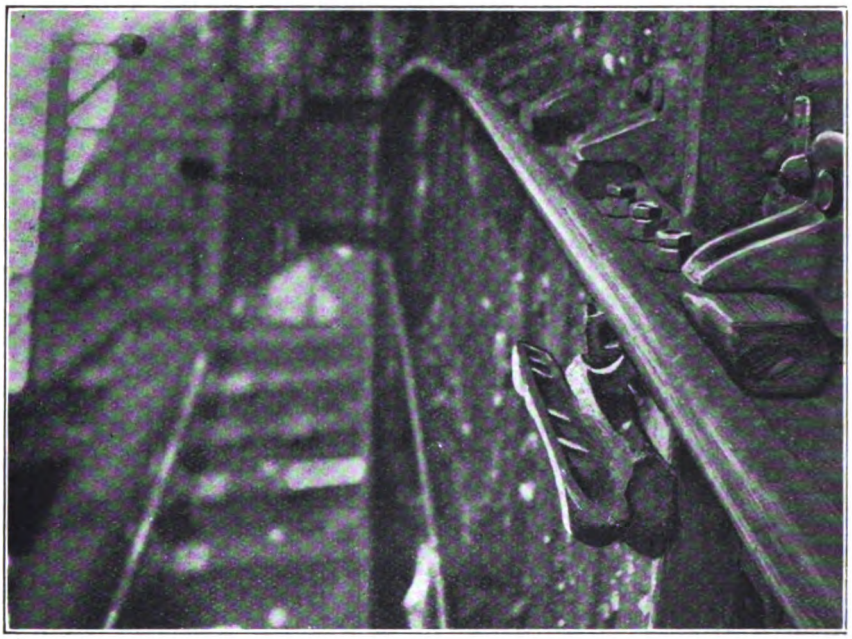
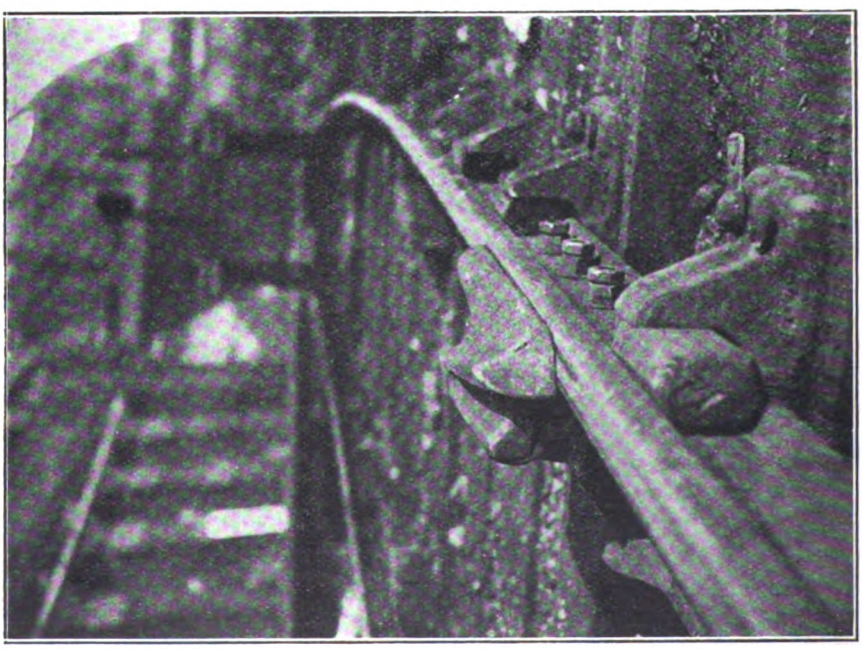


DERAILER IN "OFF" POSITION, ATTACHED TO LEFT-HAND RAIL.



DERAILER IN "ON" POSITION, ATTACHED TO LEFT-HAND RAIL.

DERAILERS AT LIVERPOOL STREET STATION, GREAT EASTERN RAILWAY.

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assigned for the terminal or railway for which it is intended.

When sufficient of the loaded transfer cars are ready to make a train, the route will be set so that it can pass out on to the main line of the subway and then travel at about 13 miles per hour without attendance, its passage being controlled by suitable track devices ensuring that it cannot be overtaken by another train. At intervals diverging tracks will be laid to the respective terminals or depôts, and at the various junctions operators will be stationed, whose duty it will be to divert each train as required according to the destination indicators which it bears. As a train reaches its objective, power will be cut off and the brakes applied automatically.

Arrived at destination the transfer cars will be run one at a time upon an elevator arranged to raise them to a reception platform, where the platform trailers can be wheeled off and replaced by the empty trailers from a previous load. The loaded trailers can then be wheeled to an unloading bank or taken with their contents to a warehouse for storage, while the return transfer cars, with their empty trailers, are passed to an outbound freight platform where their empty trailers are wheeled off (for use as required) and replaced by a loaded set ready with freight to go away. They are then despatched automatically either to another destinaton or back to the joint yard. On returning to the joint yard the trailers, after coming to a stand under automatic control, will be dealt with singly at slow speed under the control of an operator walking alongside, and diverted on to the appropriate track in the yard for loading upon standard cars. The latter operation will be carried on at an extension of the receiving platform first mentioned, so that it will only be necessary to move the standard cars from the unloading portion to the loading position, and they can thus be returned into revenue-earning traffic very shortly after they have deposited an arrival load. The proposed subways will necessarily be operated at a low level, passing under streets and buildings, with elevators as required for transfer to or from a higher level. An essential feature will be the track control installation. This will be characterised by the maintenance of a "dead" section between any two trains proceeding in the same direction or conflicting with one another in any way.

Derailers for Safeguarding Engine Sidings.

SEVERAL of the engine sidings at Liverpool Street Station, Great Eastern Railway, have been fitted with Saxby & Farmer derailers, as illustrated, respectively, in the "on" and "off" positions. These are used as they occupy only a foot or two, as compared with the 10 ft. or so required for trap points, installed as a safeguard against an engine attempting to move on to its train before the road is set. There is, therefore, more room for engine movements, and a driver can enter more expeditiously than when he has to stop close up to the buffer stops and with extreme exactitude.

The derailing is done by a flange on the head of the derailing member. This, when looked at from the facing direction, is from the inside, across the head, and to the outside of the rail, and so guides the wheel off the rail. For an opposite or trailing movement, should the derailing member happen to be on the rail, the flange of the wheel passes between two raised portions at the outer end of the head of the member. They lift the wheel and carry it over the derailer, so that the wheel does not leave the rail but is given a bump only. The bracket is 2 ft. long overall, and the derailer is 1 ft. 5 in. long, and the whole weighs approximately 1 cwt. There are right-hand and left-hand heads to suit the fixing on right-hand or left-hand rails. If the line to be protected is on the right the derailer is fixed on the left-hand rail of the siding and *vice versa*. The derailer can be worked from a signal-box or by a ground-lever, or even by hand.

Automatic Train Control.

FOR years inventors have been producing schemes and devices for controlling trains independently of the drivers, and apart from those which have emanated from practical men it must be confessed that most of them have been of a very crude and primitive character. It is easy to devise something of the kind; but a very different thing to produce one suited to running and traffic conditions, which will meet the needs of special situations, and which can be trusted, year in and year out, in all weathers and with only ordinary supervision and maintenance. Of late years, however, the matter has been receiving very close attention on both sides of the Atlantic, and it is now being carefully considered by a Committee appointed by the Ministry of Transport. In fact, in some measure it is already in use, for the "trip" gear used on the London Underground electric railways, the Great Western Railway cab-signalling apparatus, and the Raven system on the North Eastern Railway, have now been in satisfactory use on a considerable scale for several years. The chief difficulty is, however, that of meeting the needs of the varying traffic of a busy main line, coupled with the question of expense. The latter point raises also the issue of whether distant

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SCHOOL OF SIGNALLING, PADDINGTON, GREAT WESTERN RAILWAY.

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or stop signals, or whether all of them should be equipped

Study of railway accident reports shows that no one principle will meet every circumstance. For example, a train starting against a signal can only be protected by a train-stop appliance there fitted; but for a high-speed express or a long heavy goods train with its limited brake-power, control must be exercised much further back if it is to safeguard the actual danger point. For that reason expert opinion takes the view that the "distant" signal is the crucial point for running safety, and that if a partial brake application is there given should the signal be adverse, all that is required is secured. As desirable, starting and other stop signals controlling the actual danger points may be equipped; but the primary need is for the distant signal to be fitted with control gear.

Train Stop Tests on Steam Railways.

WITH the large proportion of brake power and the moderate speeds usual on local electric lines the trigger device is found quite satisfactory; but on ordinary lines, especially where speed may be fairly high, the trains running fast or slow, passenger or goods, heavy or light, this arrangement does not meet the case. Both the Great Western and the North Eastern systems have given good results, but opinion is divided as to whether it is good practice to depend too much on electricity, or to carry batteries and delicate electrical apparatus on the engines. In most cases a ramp is fitted on the track and arranged so that according to whether it is electrified or not the apparatus on the engine is caused to hold off, or allowed to apply the brakes. This application is usually partial at a distant signal, and the driver can then reset the gear to enable him to run on to the stop signal with his train under control. At a stop signal the gear cannot be released except from the ground, thus forcing the driver to stop whether he wishes to or not.

For some time the "SYX" electro-mechanical train stop, introduced by the W. R. Sykes Interlocking Signal Company, Limited, has been in use at Seven Sisters Junction on the Great Eastern Railway, while it has also been the subject of extended trials on the Loughton and Ongar branch. As thus applied in the former case, for safeguarding auto-trains on the branch and to permit them to enter the station without necessitating the holding up of other trains, the junction being a through one, without trap points or a dead-end for which the road can be set, an auto-train is first checked at the distant signal, and beyond its stopping place is an emergency ramp which would bring it to a dead stand within the over-run distance available were the driver to proceed thus far. Here the application is in connection with the Westinghouse brake, but the same apparatus was recently tested at Stoke-on-Trent, fitted to a North Staffordshire Railway engine, and, therefore, using the vacuum brake.

Stop Signals or the "Distant"?

THE principle of the "SYX" apparatus is that a shoe under the engine rises over a ramp between the rails so as to cause the brakes to be applied every time unless it is restrained. In the gear there is, however, a toggle device which, if the ramp is electrified, is stiffened by means of electric solenoids, so as to prevent the brake valve being operated. Consequently the brake tends to be applied every time a ramp is passed over, but if the ramp is electrified, the signal being off, the brake is held off electrically, and so no application follows. This occurs at the distant signal, and the driver has a resetting device, so that after the brake has been applied he can release it and run on carefully to the stop signal, though if he does not release himself the brake application will eventually pull him up, even with steam still on. By arranging for a higher lift or a second application at the stop signal, the train can be brought finally to a stand, and then the driver can only release the apparatus by descending from the footplate. In the tests which we have been privileged to attend various running conditions were all successfully met by the apparatus, and where permanently installed continued service has proved quite satisfactory. Undoubtedly, however, the first need is for such apparatus to be installed at the distant signal, as that ensures a sufficient distance to effect a stoppage before the actual danger point is reached, and it can hardly be contemplated that a driver would then wilfully risk an accident after having had such warning, though he may have overlooked the distant signal itself, mistaken a stop signal for the distant, or accepted a signal for a parallel line as applying to himself.

Station Indicators for Railway Trains.

AT various periods trials have been made on several railways of indicators placed in the trains and showing the name of the next station to be stopped at, though so far none has come into anything like general use. An indicator including interesting features is now, however, in service. This new type of station indicator is being introduced by the firm of Indicators, Limited, 11, Southampton Row, W.C.1, and is installed on the Great Northern and City section of the Metropolitan Railway. At present it is fitted

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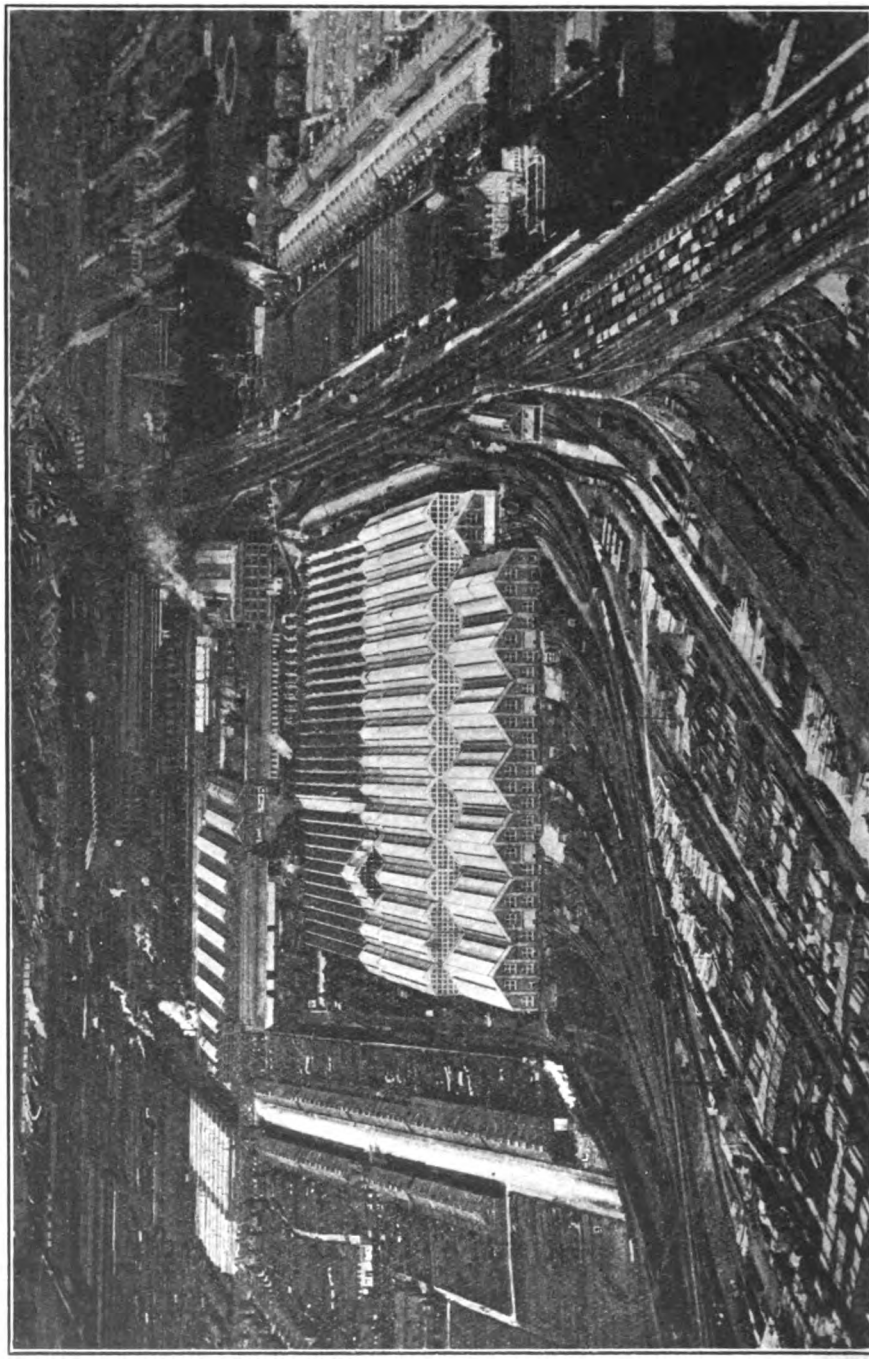

Photo.] VIEW OF SWINDON WORKS, GREAT WESTERN RAILWAY, TAKEN FROM AN AEROPLANE. [*Topical.*

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to two coaches only on one of the trains, but the remainder of that set are to be correspondingly equipped, and in due course other sets will be fitted up. This short line affords an ideal trial ground, seeing that although only a limited number of stations are involved the trains frequently omit one or more and there are several combinations of non-stopping stations. The indicators are placed in V frames, two in each coach, about midway on either side of the middle doors, so that each indicator has two faces showing at a convenient angle either way. A feature of the equipment is that each panel carries, beside the name of the station, a map showing adjacent thoroughtares, &c., while attention is also directed to places of amusement, or large trading establishments in the vicinity.

At the commencement of a journey on which one or more stations are to be passed without stopping the motorman or guard sets the indicator and the words "Not stopping, at" appear above the names of the stations affected. This indication shows throughout the journey, but as the indcator changes on leaving a station the panel relating to a non-stopping station is passed over and that next to be called at becomes illuminated. Except for such special adjustment the indicator requires no attention, as the reversal of a journey merely involves the operation of the contacts in reverse order.

These indicators are also adaptable to longer journeys, and if need be, for alternative routes, in which case the requisite adjusting devices are provided in the motorman's cab.

The apparatus is automatically operated by means of a trigger device fitted on the track immediately after leaving a station or from above, as on the Great Northern & City line, and ordinarily, operation proceeds quite automatically, except for attention due to passing certain stations or alternative routing, as already explained.

Mile Posts on the London & South Western Railway.

In the course of his articles dealing with locomotive and train working on the London & South Western Railway, Mr. Ahrons referred to discrepancies between distances given by Foxwell 30 years ago and Bradshaw of to-day. Mr. T. D. Thomson, writing from Nigeria, adds some remarks concerning the location of mile-posts which may appropriately be summarised as follows:—At Basingstoke the 47¾ mile-post is in the station, near the dead-end of the Alton line bay, on ground level, against the platform, and, therefore, difficult to locate from a passing train. At Andover the post is attached to the station wall, but not clearly discernible because of advertisements and notices. Mile-post 83½ at Salisbury is located as at Basingstoke, but the gateway from booking office to platform is nearly in line. Yeovil Junction lies about midway between posts 122½ and 122¾, the extreme west end nearly reaching the latter. The 118 mile-post at Sherborne is on the platform near the east end; at Templecombe the 112th mile-post is attached to the wall as at Andover, about midway along. At Winchester the 66½ mile-post is on the platform towards the down departure end.

The Railway and Locomotive Historical Society.

Whether there is as great a general interest in railway and locomotive working in the United States as is the case in the United Kingdom is not very clear, but there are many enthusiasts on the other side of the Atlantic, and we are advised by Mr. A. Curran, of 16, Ballard Street, Newton, Mass., U.S.A., of the formation of a Railway and Locomotive Historical Society. Mr. R. W. Carlson, of 315, N. 16th Street, Escanaba, Mich., is Corresponding Secretary, while other officers are located in various American cities. The Society's letter-paper bears a view of an historic Michigan Central 4-4-0 locomotive. Mr. Curran suggests that some of our readers "may feel a corresponding interest in American progress." He will welcome correspondence, which should, however, be accompanied by postage.

The N.U.R. Railway Bill.

Introduced by Mr. J. H. Thomas, a Bill has been presented to Parliament entitled "Ministry of Transport (Transfer of Railways) Bill." In effect, it provides "for the purchase by the State of all the railway undertakings in Great Britain, and for their subsequent management in the public interest under the direction of the Minister of Transport." Purchase is to be carried out through the issue to railway stock and shareholders direct (and not through the intervention of the companies) . . . of a specially created railway stock charged on the State railway undertaking and the Consolidated Fund, which shall bear such a rate of interest as would enable it at the time of issue to be realised at par. The purchase price is to be calculated on the basis of pre-war market prices of existing railway stocks, but be subject to a reduction (later proposed to be 30 per cent.) relative to the amount by which securities generally have depreciated in value in consequence of the war. Provision is also made for the difficulties attending valuation, the redemption of stock at par within 60 years and other financial aspects. It is proposed that the general direction of railway business shall devolve upon seven Commissioners, while the Minister will be

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responsible to Parliament. The Commissioners are all to be whole-time servants paid the same salaries. Six shall be appointed by the Minister of Transport, but three of these will be required to be nominated by the recognised railway trade unions. The seventh Commissioner will be appointed by the Treasury.

In general, the whole scheme appears very plausible, and were it decided that nationalisation of railways is desirable, it would provide a good working basis for subsequent discussion. Unfortunately for the promoters, public opinion is by no means enamoured of the State operation of essential industries, and three of the concluding clauses reveal the "cloven hoof."

Thus, Clause 32 provides for the setting up by the Minister, *in conjunction with the three railway trade unions* (the italics are ours) of machinery for adjusting disputes as to salaries and wages and conditions of service. If this is read in conjunction with Clause 34, which "continues the existing State control and financial guarantee of the railways until the appointed day," the real object of the Bill is at once apparent. Clause 33 points out the obvious fact that if the railways are thus taken over by the State it will not be necessary for the State to continue payments in respect of arrears of maintenance, depreciation and renewals consequent on the war. We note also the somewhat specious provision of Clause 22 that "directors of the railway companies shall retain during their lives the free travelling passes which they now hold."

It remains to be seen how this Bill will be received in Parliament, especially as it is issued in advance of the promised Government Bill for the future of railways, so that both will be under consideration more or less concurrently. As the Government measure is still not available as we close for press, its presentation having been deferred owing to the difficulties occasioned by the coal strike and the threatened sympathetic strikes of railwaymen and transport workers, we cannot deal with the two Bills on a comparative basis.

ELECTRIC ROLLING-STOCK AS A STEAM TRAIN LOAD.

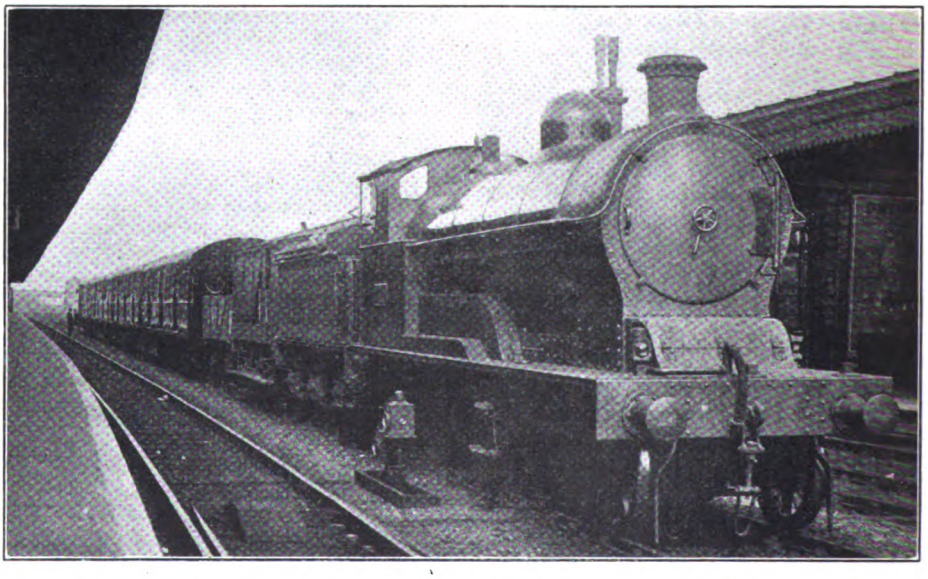

Photo.] [*Leslie J. Thompson.*

Special train of Metropolitan District Railway new electric rolling-stock *en route* from Birmingham to London, standing for examination at Northampton, London & North Western Railway. 4-6-0 locomotive, No. 1413, "Henry Cort."

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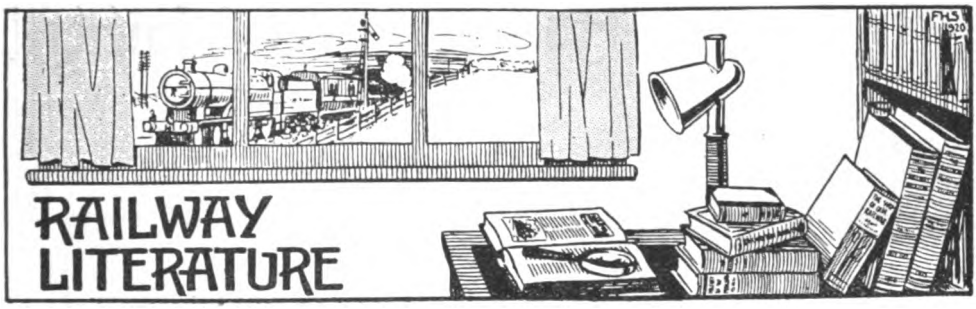

DANGER AHEAD! [The St. Catherine Press, Stamford Street, Waterloo, London, S.E.1. Price 6*d*. net.] Compiled by the Central Council of the English, Scottish and Irish Railway Stockholders' Protection Associations, this booklet is described as "A Statement of the Railway Stockholders' Case." It is, in effect, an appeal to railway shareholders to take action, or support organised measures therefor, to safeguard their own interests in view of the difficulties and uncertainties of the railway situation in regard to the de-control of railways in August next. In twelve concise chapters the subjects of railway companies' claims in respect of deferred maintenance, &c.; what is a "fair return"; grouping; de-control; the investors' point of view; the need for co-operation amongst owners, workers and users; the danger to the Scottish railways; and the critical case of the Irish railways, &c., are dealt with lucidly and carefully; while the text is enlivened by reproductions of some of "Poy's" cartoons. This booklet is well worthy of careful reading and study, especially in view of the urgency of the matters in dispute.

STEAM LOCOMOTIVE CONSTRUCTION AND MAINTENANCE. By E. L. Ahrons. [Sir Isaac Pitman & Sons, Limited. Price 2*s*. 6*d*. net.] The author of this useful volume needs no introduction to readers of the RAILWAY MAGAZINE. He deals with workshop equipment and practice in the construction of steam locomotive engines, with notes on inspection, testing, maintenance and repair. Admittedly elementary in general treatment, the eleven chapters included cover the ground very thoroughly, and the work may be commended to all who wish to add to their general knowledge of locomotive engines an understanding of the workshop methods and practices associated with construction and maintenance in service. Fifty drawings and photographic reproductions are given as illustrations. The book is in stock at the RAILWAY MAGAZINE offices.

RAILWAY SIGNAL ENGINEERING (MECHANICAL). Second Edition Revised. By Leonard P. Lewis. [Constable & Co. Price 14*s*. net.] In its first edition this work has become a standard text-book. The author is on the staff of the Caledonian Railway, and is lecturer on railway signalling at the Royal Technical College, Glasgow. The whole range of mechanical signalling is covered very thoroughly, including the classes and uses of signals, constructional details of signals, point connections, interlocking, signal box arrangements, signalling schemes, miscellaneous appliances, Board of Trade rules, and methods of working trains, with appendices on fog signals, swing bridge contacts, track circuits and reminders for signalmen. The 360 pages of text are illustrated by 250 diagrams and drawings. In the present edition the original subject matter is revised and brought up to date, track circuit receiving special attention, new material being incorporated wherever necessary for completeness.

INSTRUCTIONS FOR DRIVERS OF SMALL LOCOMOTIVES. A neat booklet prepared by Andrew Barclay, Sons & Co., Limited, of Caledonian Works, Kilmarnock, for the use of drivers of contractors' and other small locomotives. General instructions for raising steam, use of injectors, &c., and for dealing with minor difficulties which may arise in service are clearly given.

YEAR BOOK OF WIRELESS TELEGRAPHY AND TELEPHONY, 1921. [The Wireless Press, Limited.] Revised and brought up-to-date, the new edition of this useful annual includes a new article on outstanding problems of radio reception, description of a modern shipboard wireless set, a technical review of the development of wireless telegraphy, and a list of schools and colleges where wireless telegraphy and telephony are taught. All usual features are retained, and within its 1,350 pages a wealth of useful data and information is presented.

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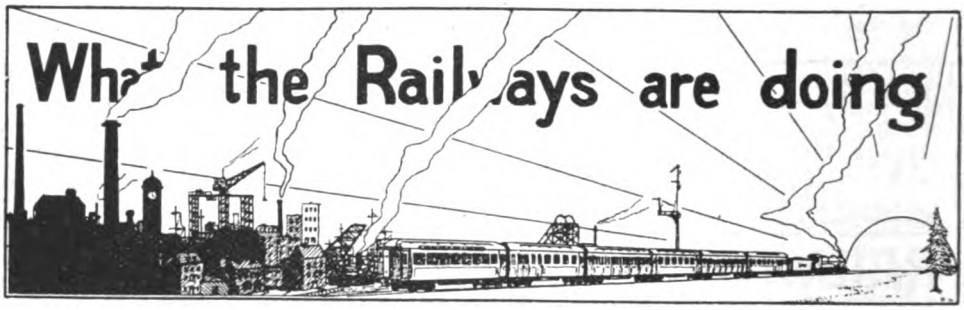

MR. A. T. COTTON, previously Irish Traffic Manager of the London and North Western Railway, has become Mineral Traffic Assistant to the Chief Goods Manager of that company. At the end of January, 1916, Mr. Cotton succeeded Mr. John A. Findlay, Abergavenny District Traffic Superintendent for South Wales and the West of England, London and North Western Railway. Prior to that he was the Lancashire and Yorkshire and London and North Western Joint Goods Superintendent at Belfast. Mr. Cotton had his training in Ireland on the Northern Counties Railways, of which his father was General Manager for nearly half a century. It may be recalled that at the annual meeting of the Dublin and South Eastern Railway on February 26, 1920, the Chairman (the Right Hon. Frank Brooke) observed that Mr. Arthur Tennent Cotton, the representative of the London and North Western Railway, had been co-opted to the vacant position on the board caused by the retirement of Mr. Burgess, Deputy Chairman, who had been appointed Director - General of Transport for Ireland. Mr. Brooke added: "Both your board and you have every reason for congratulation on getting such a colleague and one who, I know, has your interests thoroughly at heart."

MR. A. T. COTTON,
Mineral Traffic Assistant to Chief Goods Manager, London and North Western Railway.

* * *

DEATH on March 14 of Mr. Alfred James Snow, the Locomotive Accountant of the Great Eastern Railway at Stratford, at the early age of 38 years, brought prematurely to a close, a very promising career. Mr. Snow had held his position for over six years, and his great abilities had earned for him the full confidence, not only of his colleagues, at Stratford and the head of his department, Mr. A. J. Hill, the Chief Mechanical Engineer, but also of the Directors and the other chief officers of the company. He joined the service of the Great Eastern Railway at the age of 14 as a junior clerk, and was an assiduous student at many evening classes and lectures, gaining many successes with the Society of Arts, the London Chamber of Commerce, the London School of Economics and similar bodies, and becoming a Fellow of the Association of Accountants and a member of the Institute of Transport. Mr. Snow is succeeded by Mr. David Sayer, who has throughout acted as a most efficient Chief Assistant.

* * *

ON the evening of April 1, some of the principal members of the Great Eastern Railway Commercial Department staff met for an informal dinner at the Liverpool Street Hotel, when Mr. T. W. Watts, the Commercial Superintendent, occupied the chair, and Mr. J. Studd, his Chief Assistant, the vice-chair. Those present included the Divisional Commercial Superintendents from London, Ipswich, Norwich and Cambridge, the Chief Clerks at Headquarters and the Divisional offices, the Sack Superintendent, the Lowestoft Harbour Master, the London and County Goods Agents, the Commercial

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Assistant, Station Master and Parcels Agent at Liverpool Street and the Company's Northern Representatives. The opportunity

MR. M. G. TWEEDIE,

Honorary Secretary of the Institution of Railway Signal Engineers.

was taken of making a presentation to Mr. Watts, in view of his forthcoming marriage, of a Spode China desert service from his Chief Clerks and Divisional Officers, and a case of silver desert knives and forks from the Goods Agents, Northern Representatives, and others.

* * *

MR. M. G. TWEEDIE, of the Great Western Railway, Reading, who was recently appointed the Hon. Secretary to the Institution of Railway Signal Engineers, received his technical training at the Finsbury Technical College, and has been through the technical departments of the Great Western Electric Light, Locomotive, Carriage and Wagon and Electrical Engineer's departments, and is now on the technical staff of the Signal and Telegraph Engineer. Mr. Tweedie is an Associate Member of the Institution of Electrical Engineers; served over four years in France in command of railway telegraph companies, and read a paper "British Railway Telegraphs in France, 1914-19," before the Institution of Railway Signal Engineers on January 7, 1920.

* * *

AT the annual meeting of the Cambrian Railways Company, Major David Davies, the Chairman, stated that he was glad to say that the directors had prevailed on Mr. Williamson, the Secretary and General Manager, to take a well-earned holiday, and they hoped he would be restored to them with a full measure of health and strength when he returned. Mr. Williamson subsequently sailed for New York, but is now back at business after a very beneficial rest.

* * *

THE gold medal granted by the Great Western Railway for exceptionally efficient first aid rendered during the year 1920, has been awarded to Mr. A. D. Savage, Clerk in the Goods Department, Taunton, and son of Mr. and Mrs. Savage, Ballater, Coombe, Teignmouth, in recognition of his treatment of injured persons on the occasion of the fire at Sanger's Circus, Taunton, in July last.

* * *

IN the absence of the Chairman (Right Hon. J. A. Waldron), Mr. Joseph Tatlow presided at the recent half-yearly meeting of the Dublin and Kingstown Railway. The board declared a dividend on the capital stock of the company at the rate of 8 per cent. per annum, less income tax.

* * *

MR. CHARLES TALBOT, recently deceased, had for 20 years held the positions of General Manager and Secretary of the

THE LATE MR. CHARLES TALBOT,

General Manager and Secretary, Neath & Brecon Railway, 1901-21.

Neath and Brecon Railway, and during that period resided at Neath. Prior to succeeding to the dual appointment he was

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Secretary of the company at the London offices for many years. He was 65 years of age, and death followed a long illness. As a railwayman, Mr. Talbot was held in good repute.

* * *

FOUNDED last year, the Great Western Railway (London) Operatic Society has made its *debût* at Hanwell with brilliant success. Gilbert and Sullivan's "H.M.S. Pinafore" was produced at the Park Theatre, and four evening performances and a special matinée were given. The latter, on Saturday, April 2, was in aid of Earl Haig's Warrior's Day Fund. On Friday evening, Viscount Churchill, G.C.V.O. (Chairman of the company), and Sir Ernest S. Palmer, Bart., M.P. (Deputy Chairman), attended, and were introduced to the principals during the interval. They heartily congratulated one and all on making such a successful *debût* and laid particular emphasis on the good work done by Mr. G. H. Hemmen (hon. producer) and also Mr. W. R. Palamountain, A.R.C.M., (hon. musical director). Saturday evening's performance was also attended by a number of the company's officers, amongst whom were Messrs. R. H. Nicholls, C.B.E., E. Ford, H. L. Wilkinson, F. Potter, F. W. Showers, C. M. Jacobs, E. Rendell, J. Page, A. Maynard, F. B. Mortimore and O. T. Wood. On the final fall of the curtain Mr. A. G. Hitchcock, Chairman of the Society, appeared before the footlights and introduced the President, Mr. Felix J. C. Pole (Assistant General Manager) who heartily congratulated the officers and members of the new society on its initial success. In speaking of its constitution the President said that the society was run on strictly democratic lines and was open to all grades of the Great Western staff residing in the London area.

* * *

STARTED in 1908 by the directors of the railway in the interest of the social well-being of the staff, the Great Eastern Musical Society has been an extraordinary success. It would be a difficult task to set out in detail the enormous amount of pleasant recreation it has afforded the members or to measure the delight and appreciation of their numerous audiences. Beyond all estimate, too, is the value of the service rendered the Society by its orchestral and general hon. secretary, Mr. A. W. Headley, who is as unwearying in its interests as he is deservedly popular among the members and the public who attend the concerts. In Colonel Wm. Johnson Galloway, the hon. conductor, the Society possesses a tower of strength and under his able direction success is always taken for granted.

Photo.] **ISLE OF WIGHT CENTRAL RAILWAY.** [*Edwin J. Miller.*

Whippingham Station.

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On Saturday, March 19, the combined forces of the Great Eastern Railway Musical Society, comprising a full Orchestra of 100, and a Male Voice Choir of 250, gave a concert in St. Andrew's Hall, Norwich, before a crowded and enthusiastic audience, who showed in no unmistakable way their high appreciation of the excellent quality of the music given. Colonel Wm. Johnson Galloway conducted with consummate skill.

* * *

That the Railway Club takes every side of railway work under its ægis was manifested at the meeting on April 8 at 65, Belgrave Road, when Mr. D. H. F. Meacock gave a paper entitled "Railway Publicity." Advertising, in Mr. Meacock's words, is a highly specialised science, particularly when applied to railways: expenditure on this ground is extraordinarily moderate compared with other industrial concerns; where many undertakings spent anything from 3 to 8 per cent. of their takings, the London and North Western Railway (to name only one company) spent something under ·3 per cent. The lecturer covered the entire field of railway publicity, dealing with posters, booklets, newspaper advertisements, and efforts made in conjunction with various health resorts to the mutual benefit of both parties. It was a great pleasure to listen to Mr. Meacock's able summary of the business of railway publicity, pointed with many interesting and amusing examples of this branch of the railway business. At the May meeting of the Club Mr. Cecil J. Allen will present a paper on "Some Considerations affecting Passenger Train Time-keeping."

* * *

The twenty-third Competition for the Challenge Cup, presented by the Directors of the Glasgow and South Western Railway for proficiency in Ambulance work, took place at Barassie, April 2. The Competition is open to company's employees only who are members of sections of the Glasgow and South Western Railway Ambulance Brigade, and each section entering is represented by a team of five men. At Barassie workshops there is suitable accommodation for the purposes of the competition, and the facilities available in the Wagon Repair Shop provide means for a good practical test in the Transport Section of the competition. This year, nine teams entered, representing the Ambulance sections at the following places:—St. Enoch station; General Offices, St. Enoch; Hurlford; Muirkirk; Dumfries; Ardrossan; Troon; Newton-on-Ayr; and Girvan.

The examination of the Teams was conducted as usual by arbiters appointed by the St. Andrew's Ambulance Association, viz., Dr. J. A. Wilson, in General Knowledge; Mr. Donald Duff, F.R.C.S., in Practical Work (bandaging, &c.); Dr. William Bryce, in Transport of Injured. The proceedings, which were under the charge of Mr. Wellwood R. Ferguson, General Secretary of the St. Andrew's Ambulance Association, were presided over by Mr. David Cooper, the General Manager. The Chief Officers of the company present at the competition were Messrs Robinson, Whitelegg, Keeling, Vallance, Fraser, Muir, Russell, and Harrison; also Mr. F. H. Gillies, late Secretary, and Mr. James Manson, late Locomotive Superintendent, and a number of representatives from the various departments.

RESULT OF COMPETITION.

Order of Merit.	Section.	Marks gained (possible 300)			
		General Knowledge.	Practical work.	Transport of injured.	Total.
1	Hurlford	97	72	75	244
2	St. Enoch Station ..	92	63	87	242
3	Dumfries..	90	70	75	235
4	Muirkirk	94	60	80	234
5	Newton-on-Ayr ..	84	56	85	225
6	General Offices (St. Enoch)	94	75	53	222
7	Ardrossan	87	71	60	218
8	Troon	83	68	60	211
9	Girvan	89	70	50	209

The Cup with a Gold Medallion for each member of the team was won by the Hurlford team. The Second Prize of Silver Medallions for each member of the team was won by the St. Enoch station team, and the Third Prize of Bronze Medallions for each member of the team was won by the Dumfries team. The Hurlford and St. Enoch station teams having gained first and second places at this competition, qualify to take part in the Competition for the Scottish Railways' Ambulance Shield, presented by the General Managers of the Scottish Railways, which will be held at Inverurie this year on May 14. These teams are also eligible to enter the "President's Cup and Competition," which will be held by the St. Andrew's Ambulance Association in Glasgow during May. At the close of the Competition, Mr. Cooper congratulated

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the winning teams on their success, and expressed appreciation of the interest taken in ambulance work by all those who took part in the Competition.

* * *

THE Glasgow and South Western Ambulance Brigade consists of 21 sections, with a membership of 542, of whom the majority are employees of the company; 98 members of the Brigade have been awarded the Long Service Medal, granted by the St. Andrew's Ambulance Association for 15 years' continuous service in ambulance work, and 76 of these members are still attached to the Brigade. Employees of the Company who are holders of the Long Service Medal, and who are efficient members of the Brigade, are given two extra holidays annually with pay and certain travelling facilities, a concession granted by the Directors of the company. First Aid Classes are conducted in connection with various sections of the Brigade, and during last session at 13 such classes, 242 Certificates and Medallions were gained by those who attended and successfully passed the examinations. Of this number, 94 were employees of the company. At present 14 "First Aid" Classes are in session. In order to encourage their employees to acquire a knowledge of ambulance work, the company pay fees and provide Handbooks to those who attend the classes, and since 1886 a sum of £670 has been disbursed by the company for this purpose. The General Manager, Mr. David Cooper, who takes much interest in the Ambulance movement, also offers a special prize annually for the best essay on a subject pertaining to "First Aid." Ambulance Appliances have been provided at over 100 stations and depôts, also on break-down trains, ballast trains in the workshops, and on board the steamers belonging to the company. In the workshops at Kilmarnock a special room, in charge of a qualified attendant, has been provided for the purpose of "First Aid" treatment, and during the past year a large number of cases of injury have been dealt with. "Foreign Bodies in Eyes," accounted for 342 cases, which were successfully relieved. The number of dressings applied during the year was 4,262.

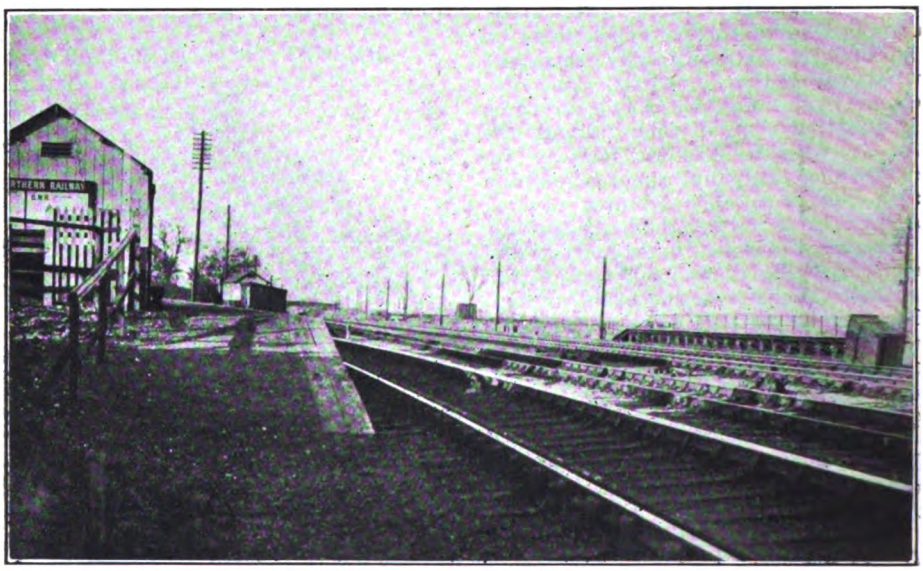

Photo.] GREAT NORTHERN RAILWAY. [*Edwin J. Miller.*

Garden City Station, Welwyn. Down view showing platforms for branch line trains.

* * *

WELWYN (Garden City Station), Great Northern Railway, was recently opened for the use of the inhabitants of the new Garden City. It is situated 1½ miles south of Welwyn station, and about ⅝-mile north of the 20-mile down signal box, the up distant signals for which are only a few yards on the London side of the easterly platform. The position of the platforms is peculiar, inasmuch as though the four tracks of the main line pass between, only trains to and from the Luton and Hertford branches can call at the station. Pending development operations on an

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extended scale the station is of a temporary character. The booking-hall is on the westerly platform, that serving Luton, and access to the Hertford platform is gained by an overbridge—a former road bridge since renewed. It will be observed from the picture on page 352 that the branch to Luton curves away, in the station, from the main line, while the Hertford branch continues alongside to just north of the road bridge visible about ¼-mile distant. Nearly all of the branch week-day trains serve the station, but it is at present closed on Sundays. It is provided with a "running" siding on the Luton branch worked by hand switches padlocked. The two branches are of single track and the station has no fixed signals, being on the section extending from 20-mile down box to the first station on each of the respective branches.

* * *

E.K.H., writing from Nairn, N.B., has forwarded the following extract from *Punch*, October 3, 1846, wherein it appeared under the caption "Railway Luxuries":—

"The smoking saloon on the Eastern Counties is only the first of a series of luxuries which it is intended to bestow upon travellers by railway. It is in contemplation to run a refreshment room with every train, so that people will have time allowed them to eat the articles sold, instead of being restricted, as at present, to the privilege of payment. Various plans have been suggested to enable passengers to swallow a cup of boiling tea or coffee, or a basin of hot soup in a minute and a half, but it has been proved that the period specified is quite insufficient for such a purpose. It has been suggested that there might be kept and sold at all the refreshment rooms a preparation similar to that which enabled Monsieur Chabert, some years ago, to swallow melted lead without any inconvenience. Others have proposed that parties should be allowed to take soup or tea into the carriage with them, and send back the cup or basin by the up or down train, with a return ticket fastened to the piece of crockery as a proof of its contents having been paid for. The most feasible scheme is, however, a portable refreshment room, one of which should travel with every train; and it might be advisable to have the boiler of the engine supplied with soup instead of plain water. It has been calculated that the steam produced from the former liquid would have much greater force than the vapour arising from the latter, and the power of the pea in the peasoup would have a wonderful influence on the speed of the locomotive."

* * *

A SCOTTISH reader mentions that on the

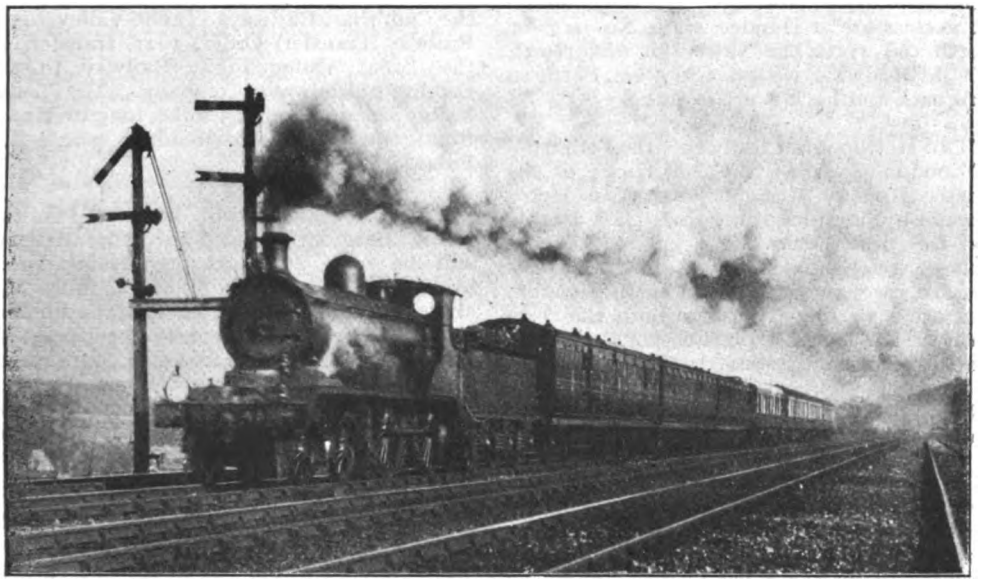

Photo.] LONDON, BRIGHTON AND SOUTH COAST RAILWAY. [*C. J. Housego.*

Victoria-Brighton Express, with 1st and 3rd Pullmans, near Purley.
4-4-0 Locomotive No. 45.

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Caledonian Railway, Mr. Pickersgill has been adding to his 4-4-0's. The new ones correspond with the "928" class and bear numbers in the seventies and eighties, which formerly belonged to Drummond's 4-4-0 mixed-traffic class. On the North British Railway, some of Mr. Holmes's last 4-4-0's have now been rebuilt to conform to Mr. Reids' "317" class in most respects. Two interesting old locomotives are to be seen at work in Fife. They are rebuilt 2-4-0's and formerly belonged to the "418" class—they are now numbered 1240 and 1247: the former is at Inverkeithing, while the latter works from Ladybank to Alloa. The engine at present working the Bervie Branch is a rebuilt 0-4-4 tank, No. 1334 (formerly 167): Nos. 1325 and 1338 of the same class are at Dundee, while No. 94 is at Perth and works the Newburgh and North of Fife Railway, with a trip from Perth to Arbroath and back every evening.

* * *

THE Metropolitan Railway—the "Metro" of London—excelled the "hat trick" at the Easter Monday Regent's Park Van Horse Parade by obtaining nine First-class awards for the nine horses they entered. These horses, which are employed in the Parcels Service, are among the finest in London, and are a sterling tribute to both the company and the staff responsible for their care. The exceptionally smart appearance of the animals was generally commented upon, whilst the spick and span condition of the vans reflected additional credit.

* * *

A NEW departure has been made by the Great Northern Railway in regard to the letting of advertising spaces on stations, walls, fences, buildings and other property, which arrangements were for many years in the hands of W. H. Smith & Son. From April 1, these spaces have been controlled and let direct to advertisers by the railway company. Enamelled plates, painted boards, posters and showcases are accepted for exhibition, and full particulars will be supplied on application to The Public Advertisements Department, 26, Pancras Road, London, N.W.1. This development is an extension of the scheme adopted some 10 years ago when it was decided to let direct the spaces in the booking-halls, waiting rooms, and local trains, which arrangement has proved very successful.

* * *

THE Model Railway Club held its first post-war exhibition at St. John's Schools, Tottenham Court Road, London, on Thursday and Friday, March 31 and April 1 last. The venture was a great success and the attendance of visitors large. The exhibits, judged by Mr. P. Marshall, of the "Model Engineer," and Mr. J. C. Cosgrave, of the Locomotive Publishing Co., Ltd., assisted by Messrs. Keen and Stedman, of the Leeds Model Company, were of a high order, and the Club was complimented by the Judges on the excellency of the work. The Club's track was in constant use and most of the engines on show were put through their paces. During each evening, shunting competitions were held, and provided visitors with great amusement. At the conclusion of the second evening, the prizes and certificates were presented to the successful competitors by Mrs. Keen, who was accorded a hearty vote of thanks.

* * *

THE Minister of Transport has confirmed the Cambrian Railways (Tanat Valley Light Railway Transfer) Order, 1921, transferring the Tanat Valley Light Railway to the Cambrian Railways Company. The Tanat Valley line is about 15 miles long and runs from the Shropshire border nearly to Bala.

* * *

THE miniature railway between Penrhyn Point, Barmouth, and Fairbourne Station, will be open for passenger traffic again for the Whitsuntide holidays, May 14, and continue during the whole of the summer season. The locomotive, *Prince Edward of Wales*, has been thoroughly overhauled during the past winter by Messrs. Bassett-Lowke, Ltd., and several improvements added. Mr. John Wills will be in charge of the railway.

* * *

JOSEPH KAYE & SONS, LTD., of "Kaye's Lock" fame, have received a renewal of their contract for supplying their patent oilcans and spouts to the British Navy.

* * *

IN order to reduce the time allowed for the transit at Dieppe, both outward and homeward bound, the French State Railway Administration have arranged for the passports to be examined on the trains between Dieppe and Paris, and *vice versa*, by the day services, leaving Victoria (London, Brighton and South Coast Railway) at 10 a.m., and Paris (St. Lazare) at 10 a.m.

* * *

A FIRE just north of Poupart's Junction, London, Brighton & South Coast Railway, recently rendered it necessary to suspend the running, temporarily, of all electric trains, and the diversion of steam trains via Stewart's Lane and Longhedge Junctions. Mr. W. Cavan mentions that he saw a 4-4-2 tank engine "sandwiched" between two 6-coach electric trains and working them.

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THE RAILWAY MAGAZINE.

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H. A. WALKER, *General Manager.*

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COMING EVENTS.

June 18th—New Cross Running Sheds, L.B. & S.C.R., 2.30 p.m.
July 9th—Euston Carriage Sheds, L. & N.W.R., 2.30 p m.

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THE RAILWAY MAGAZINE. [*Photograph by F. E. Mackay.*

LONDON & SOUTH WESTERN RAILWAY
West of England Express.
4-6-0 Superheater Locomotive, No. 737.

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Photo.] [*F. E. Mackay.*

THE CONTINENTAL SHED, INCLUDING THE ORIGINAL PASSENGER STATION PREMISES.

Notable Railway Stations and their Traffic.

BRICKLAYERS' ARMS GOODS DEPÔT, SOUTH EASTERN & CHATHAM RAILWAY.

By J. F. GAIRNS.

HITHERTO, these articles have been mainly concerned with the large passenger stations in the United Kingdom. Many of the principal goods depôts are, however, not only equal or superior in traffic importance, but also provide much material of great interest. The traffic dealt with is, moreover, far more varied in character, and its operation much more complex, than that associated with the passenger stations, while equipment and methods present many features which are well worthy of study.

The depôt selected for consideration is one of several which began as passenger stations, for in early days Bricklayers' Arms was the "West End" terminus of the South Eastern Railway, though its right to that title is not very clear, except that the Old Kent Road, adjacent to which it is situated, connects with other main thoroughfares which provide a fairly direct and convenient route to the Western districts of the Metropolis. The location is, however, ideal from the goods point of view, as wide main thoroughfares lead directly therefrom to all parts of South London, and direct to the various Thames bridges, and so to the City and the northern side of the river.

The station was used for passenger trains from 1844 until January, 1852, from which date it was handed over to the goods department. Occasionally, however, it was used for special purposes in passenger service, notably when Queen Alexandra, then H.R.H. Princess Alexandra of Denmark, travelled to London from Gravesend, on March 3, 1863. As W. J. Gordon, in "Our Home Railways," puts it: "At Bricklayers' Arms Station London received the future Queen of England on the way to the wedding

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at Windsor ; and after this blaze of glory it settled down to its position as the chief goods depôt of the line."

London goods traffic on the South Eastern and Chatham Railway is dealt with at five depôts: Blackfriars, the chief depôt of the London, Chatham and Dover Railway, also formerly a passenger station, now devoted mainly to market produce, paper and general Continental traffic, and which also includes bonded stores ; the Grande Vitesse station, adjacent to the connection from Blackfriars to the Charing Cross-Cannon Street line, which is concerned chiefly with the more valuable and urgent Continental goods traffic ; Stewart's Lane, Battersea (for tranship goods) ; Woolwich (for Arsenal traffic, and considerably extended during the war) ; and Bricklayer's Arms, the largest of all, where the general goods traffic is dealt with. This depôt was, until lately, also the headquarters of the London District goods traffic officers, but Mr. F. W. West, O.B.E., London District Goods Superintendent, now has his offices at Victoria Station.

The depôt is connected with both the South Eastern and the London, Brighton and South Coast main lines, the respective branches dividing at North Kent West signal cabin. One section is known as the North Kent branch, and passes the carriage sidings and thence to the South Eastern and Chatham Railway station at New Cross. The other, the Bricklayers' Arms branch proper, leads to the London, Brighton and South Coast Railway main line, which provided the original route of the South Eastern Railway out of London and over which a great deal of South Eastern and Chatham Railway traffic still passes.

There is, in effect, a main line through the depôt, and as this also has to serve the Bricklayers' Arms engine sheds, and certain sidings used for storing empty carriage trains during the day, work is complicated by the necessity for keeping a clear double-track line through the depôt for engine and other movements. Depôt premises, in fact, terminate at North Kent West Box, where engine shed and depôt lines converge into two tracks to cross the Victory Bridge over Rotherhithe New Road, then dividing to form the two connecting lines towards the respective New Cross stations already mentioned. There are short shunting necks at this end of the depôt, but if it is

Photo.] [*J. F. Gairns.*

GENERAL VIEW OF INWARDS SHED.

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necessary to proceed out on to the running lines, this can only be done under the directions of a traffic controller in North Kent West box. Traffic to and from the adjacent London, Brighton and South Coast Railway depôt at Willow Walk also passes over the main line, between North Kent West and Mercer's Crossing boxes.

From the main entrance off the Old Kent Road, the depôt extends alongside the main line for a little more than a mile, all tracks, goods sheds, &c., being more or less parallel to the direction of running, so that no transverse or cross movements are involved, and only in one or two places are turntables made use of. The entire depôt is, moreover, on road level, so that in all the three main buildings, and in the various yards, road vans can be placed directly against the platforms or alongside the wagons, neither hoists nor inclines being necessary anywhere. In fact, only the Granary building, alongside the Continental shed—the original passenger station—has more than the one floor, the upper stories there being used as a granary and clearance sale room. The ground floor of the granary is used for outwards loading, associated with the Outwards Shed beyond, this portion being locally known as the North Pole platform.

Altogether the depôt covers an area of 54½ acres, length is 1 mile 11 chains, the standard width is 395 ft., and there are about 23 miles of sidings. Normally about 800,000 tons of traffic are dealt with annually by a staff of about 1,000 shed and yard men, and nearly 300 on clerical work. Along the borders of the depôt area are premises devoted to the horse department—stables, sick bays, hay and provender stores, &c.—road van building and repairing shops, light wagon repair shops, and there is also accommodation and equipment for the road motor vans, the use of which has been considerably developed of late. Except while in service the depôt staff is not concerned with these, or with the associated locomotive depôt, these being under the direction of the respective departments to which they are attached.

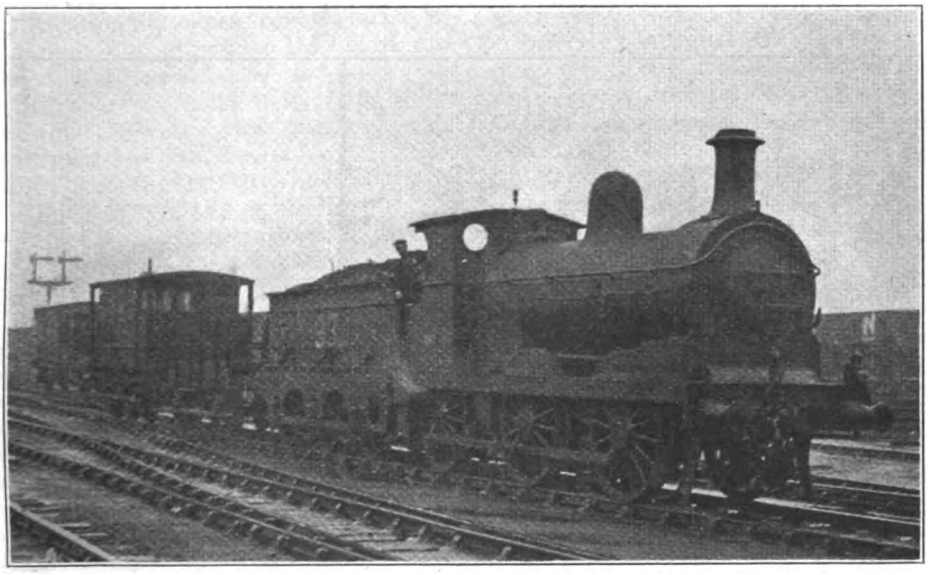

Photo.] [*F. E. Mackay.*

0-6-0 TENDER LOCOMOTIVE, WITH SHUNTERS' TRUCK, WORKING AS A DEPÔT SHUNTING ENGINE.

Before dealing with the various buildings and yards in detail, the general lay-out of the depôt may be briefly described. Adjacent to the main entrance from the Old Kent Road are the general offices on one side, including the private offices of Mr. F. H. Marshall, Goods Agent

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in charge, and on the other side of the yard are stables, accommodation for motor vans, a petrol store and a sheet store. Opposite the latter, and beyond the general offices, are the Granary and "Continental" shed, the latter incorporating the original station premises, and including in the same building various offices concerned with the more detail clerical work of the depôt. Here, also, are dining and recreation rooms for the staff, of which more anon.

Road vans for the "North Pole" platform, also for the main Outwards Goods shed longitudinally beyond and connected with it, pass through the yard alongside both of these buildings, and leave by Hendree Road gate further along, so that all road vehicles travel the same way. Beyond the Outwards Shed is the South Yard, used for loading direct from road to rail vehicles. The tracks then narrow to pass under Upper Grange Road bridge. This is often referred to as Greyhound bridge, from an adjacent hostelry, and beyond the bridge is the Rolls Road gate, connecting with Upper Grange Road, giving direct access to the Inwards Shed.

Next comes the extensive mileage yard, where full wagon loads of arriving traffic are dealt with. Under St. James' Road bridge the tracks again narrow at Mercer's Crossing, of which the old gatehouse still exists, the name being further perpetuated by the signal box here. This cabin also controls entrance to and exit from Willow Walk Goods Depôt, London, Brighton and South Coast Railway. Beyond the bridge are the sorting, high level and returned empty sidings. It will be seen that the two road overbridges, Upper Grange Road and St. James Road, virtually divide the depôt into its three main sections—Outwards, Inwards, and Sorting and Transfer, with each of which the main lines connect so that any part can conduct its own traffic and operate its own shunting movements more or less independently.

Photo.] OUTWARDS SHED AND SOUTH YARD. [*F. E. Mackay.*

There is also a substantially continuous road route alongside each of the three sections, so that the movements of road vans are similarly separated, and each section has its own entrance and exit gates.

From the depôt the line is on an up gradient, and this adds somewhat to the difficulties of operation, and it is necessary to give certain trains banking assistance when starting with a heavy load.

As a rule six locomotives are continually in service as shunters, with another from 4 p.m. to midnight, and a further one from 8 p.m. to 2 a.m. Some of these are 0-6-0 tank engines, but owing to the gradients and the heavy shunts required at times,

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several main line 0-6-0 tender locomotives are also employed. Both classes generally work with a four-wheeled shunting truck fitted with step boards and hand rails for the use of shunters, these vehicles also having powerful hand-brakes for use if required.

The various sections may now be considered in detail. Returning to the main entrance, the Outwards Shed, Granary building and Continental shed first call for attention. A single long siding, extending along the outer edge of the cartway from Upper Grange Road bridge to this point, is used for loading empty fruit baskets during the fruit season, and occasionally when other tracks are congested, but otherwise this yard provides a good clear space for road vans waiting their turns for unloading, at the same time allowing a clear pathway to the main Outwards Shed beyond.

The part of the Outwards Shed below the Granary is referred to as the North Pole, though why, no one seems able to explain. There is a single loading platform, 406 ft. long, served directly by the road vans on its outer face through the openings between the supporting pillars of the outer wall, but two lines for empty wagons are provided alongside. Openings over the wagons enable sacks of grain, &c., to be raised directly to the granary above by cranes, while sacks for despatch can be sent down to the loading platform by inclined chutes or slides. For some time past, the South Eastern and Chatham Railway has been developing the delivery of suburban goods traffic by motor vans and lorries, and much of this traffic is dealt with on this platform. Twenty-five railway wagons can be loaded directly from road vans here.

In the old passenger station the departure platform is now partially used for examining tarpaulins, which can be spread out for this purpose. This work is done in connection with the sheet store on the opposite side of the yard. The original arrival platform is similarly used for sorting and stacking sheets belonging to other railways. Both platforms are also used for the Reading biscuit traffic, one for received tins and the other for returned empties. In summer, some of the Continental fruit traffic is also dealt with here, but in general, the shed is more or less of a lie-by or reserve character. There is berthing accommodation for 71 wagons, and 10 one-ton hand cranes are provided.

Alongside are the Invoice Office (a busy section, commencing duty at 2 p.m.), the Reference Room (dealing with enquiry and investigation work), the Accounts, Cashier's, Pay Bill Clerk's, and other offices. Another part of the building accommodates a large recreation room, with three billiard tables and a boxing ring, and adapted also for concerts and dances. Adjoining, is a dining room for the clerical staff. Above are recreation and dining rooms for the uniform staff of the depôt.

Directly connected with the North Pole platform at one corner is the main Outwards goods shed, the empty wagon roads under the Granary and those of the Continental shed passing alongside.

The Outwards Shed is 1,058 ft. long and 193 ft. wide, and will accommodate 172 wagons at a time. It has four platforms and six tracks. One serves the outer side of the cart road, a continuation of the entrance reception yard, and is available for loading wagons direct from road vehicles. It is generally referred to as the Hop Road. Parallel with it, and with the cart road between, is the Inside Road, alongside the main receiving platform. In the ordinary way, road vans back against this platform, the Inside Road being used only for railway wagons when road vehicles have been dealt with. About 50 vans can unload simultaneously.

On the other side of the platform is No. 3 line (known as the New Cut), constructed some years ago to divide the very wide platform space previously available. The bulk of the loading is done on this track. A short distance along the platform, between the Inside and New Cut roads, is an office where consignment notes are handed in, and then given out, after being entered, to the checkers. These men are provided with portable desks, and usually work with two porters, the three constituting a working gang. No. 4 line is served by a somewhat narrow platform between it and No. 3, while two other very narrow platforms serve lines Nos. 5 and 6, these leading to the Outwards loading road alongside the North Pole platform, as already mentioned. There

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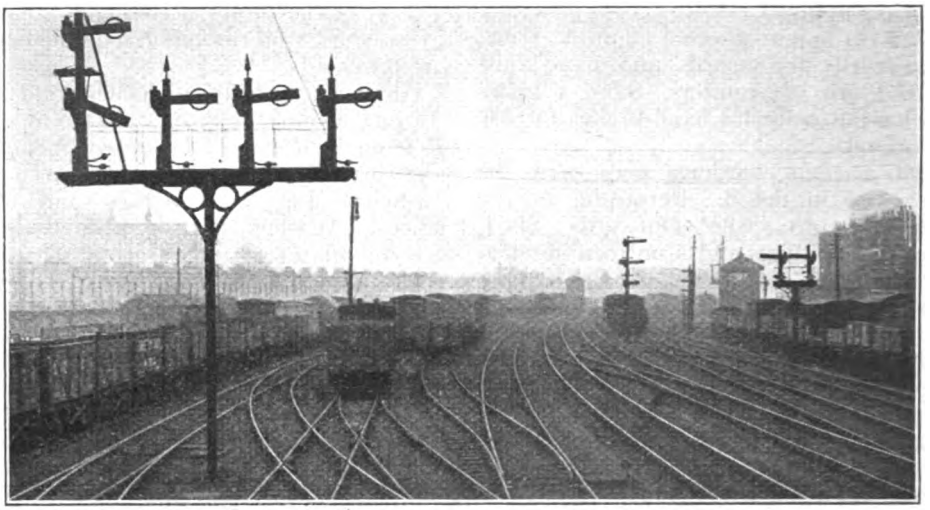

Photo.] GENERAL VIEW OF MILEAGE YARD AND SIDINGS. [*F. E. Mackay.*

are 33 hand-cranes, adapted for loads of from 20 to 25 cwt. An ordinary busy day's work is 5,000 consignments, loaded into about 250 wagons, representing 180 destinations.

The bulk of the work is done on Nos. 3 and 4 lines, and on these wagons for the principal destinations are placed in groups of from 3 to 6, separated by moveable platforms or bridges placed across the line to provide a path for porters proceeding to wagons on lines beyond. Similar bridges are also placed across other lines, but owing to the narrowness of the further platforms, the wagons alongside them are reserved for the more occasional destinations.

The general practice is to clear these lines at suitable stated periods, varying according to the volume of traffic, at which times the bridges are removed; but on each line space is reserved for four or six wagons beyond the last bridge, and these can be removed or replaced at any time by utilising the capstans in the yard adjacent. This is the South Yard, used for loading direct into wagons as full loads. A transverse line with turn-tables provides for movement without necessitating longitudinal shunting. Two large hand-cranes serve this yard, one of 10 tons capacity and the other of 7 tons 16 cwt. There is accommodation for 190 wagons in this yard, and the daily average is about 650 tons and 200 wagons. The sidings adjacent to the Continental and Outwards Sheds will accommodate about 380 wagons. A 12-ton road weighbridge is provided.

Alongside the South Yard are the stables of the Horse Department, under Mr. E. T. Stanley, Horse Superintendent, and adjacent is a chaff and provender storage building. Just beyond are small cattle pens, generally used for feeding and watering animals in transit, and the workshops of the wagon repair staff attached to the depôt.

At this point the tracks converge to pass under Upper Grange Road bridge. Immediately beyond the bridge is the Inwards Goods Shed, served by the Rolls Road gate, reached by a road connecting with Upper Grange Road. Just inside the Rolls Road gate are the cartage office, the delivery offices, a 16-ton weighbridge, and a small lock-up, immediately under the observation of the policeman at the gate, designed for the temporary storage of explosives which may be consigned by rail.

This shed is a much more modern building than those so far described. It is 702 ft. long, 98 ft. wide, and will accommodate 146 wagons. Here the cart road is in the centre, and road vans can be backed against platforms on either side, across Nos. 2 and 3 lines, which are only used for railway wagons when road van loading has ceased, or as practicable.

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At one end of the platform serving Nos. 3 and 4 lines is a wait-order lock-up room, and at the other end a general lock-up store for valuable traffic in transit. Indications are given above the platform serving Nos. 3 and 4, showing the allocation of the London delivery districts. No. 1 is generally employed for paper traffic, and for dealing with more bulky goods not suitable for yard unloading; No. 2 is devoted mainly to special traffic; No. 3 is used principally during the night, when it is not occupied by road vans, while No. 4 is the general traffic unloading platform.

This shed is served by four 2-ton and 16 25-cwt. hydraulic cranes, and about 140 wagons (800 consignments, 335 tons) are unloaded daily. This shed is also used for loading wool for the Continent, at one time a large item, though it has dwindled considerably of late. The wool is received from the docks and warehouses in London by road, and is consigned mainly to the textile districts of France. Vans with this traffic usually enter at the Mileage Yard gate further along, and leave by the Rolls Road gate. Outside the Inwards Shed is the hydraulic accumulator and pump-house, and adjacent is the Gloucester gate, used principally during the hop season. The Inwards Shed yard is served by a steam crane adapted for loads up to 3 tons.

Further along is the Mileage Yard gate serving the mileage sidings, where full wagon loads are received, with a small delivery note office. This yard will hold about 280 wagons. Beyond is the St. James' Road bridge and Mercer's Crossing signal box. Passing under this bridge the transfer sidings are reached, with the up reception lines. On the other side of the through main lines are the five high-level sidings, used for storing passenger train sets between 8 and 6 p.m., but available for waiting goods trains and as convenient for the goods department during the night. Alongside these is a line serving private owners' repair shops. About 550 wagons can be dealt with in these various sidings. In the transfer yard, wagons for other companies are sorted out. In the case of the Midland and Great Northern Railways, these are made up into trains and taken away by the engines of those companies. Wagons for the Great Eastern Railway, and some of those for the London and North Western Railway are sent to Hither Green for transfer, while other London and North Western Railway vehicles, and those for the Great Western Railway go to Stewart's Lane.

Alongside the transfer and sorting sidings is the East Yard, containing two long loading or unloading tracks (frequently used for manure and like unpleasant traffic), a storage yard for

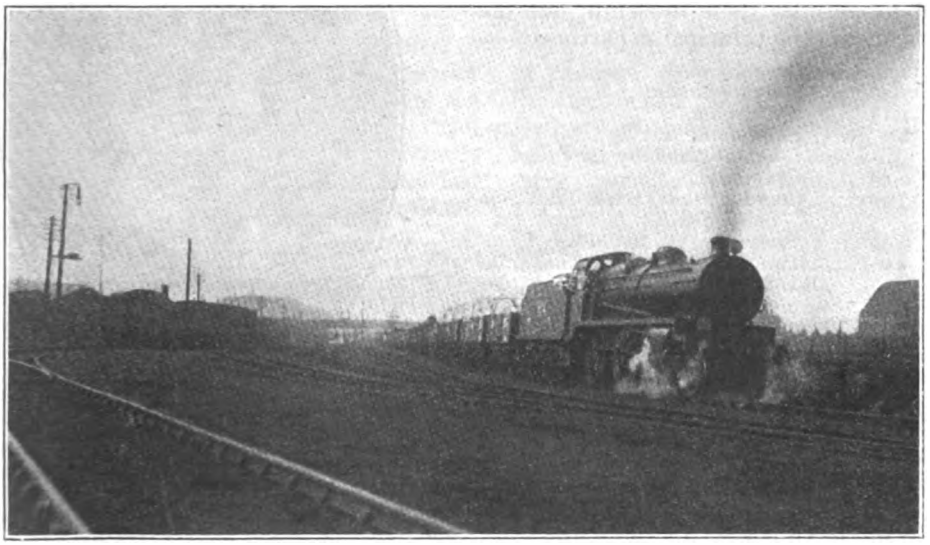

Photo.] **DEPARTURE OF THE 12.10 P.M., READING GOODS TRAIN.** [*J. F. Gairns.*
New 2-6-2 Superheater Locomotive No. 814.

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engineer's department cranes, a covered platform for returned empties, and adjacent to the East Yard gate, a range of sick horse stables belonging to the Horse Department.

Mr. F. H. MARSHALL.
Goods Agent, Bricklayers' Arms, South Eastern & Chatham Railway.

About 32 trains leave the depôt every 24 hours, but this figure is considerably increased at busy periods. There is no need to consider these in detail, but the following are the principal departures :—

12.15 a.m.	Queenborough.
12.50 ,,	Margate Sands.
1.15 ,,	Faversham.
2.0 ,,	Folkestone (taking also Continental traffic by that route).
2.40 ,,	Gravesend.
3.40 ,,	Croydon and Oxted Line, via Selsdon Road.
3.55 ,,	Tonbridge, via Redhill.
5.0 ,,	Tunbridge Wells. (This train also takes left-over wagons, detaching at Hither Green sidings those for other routes).
5.45 ,,	Croydon, Caterham and Tadworth.
6.30 ,,	Mid-Kent—Addiscombe Road.
7.0 ,,	Ash and Reading Line (when required).
12.10 p.m.	Reading.
6.35 ,,	Faversham.
9.35 ,,	Reading (if required).
10.30 ,,	Hastings
11.25 ,,	Dover (and Continental traffic by that route).
11.55 ,,	Reading.

During the hop and fruit seasons, the resources of the depôt are very severely taxed, and large numbers of special trains are then required. There are also local goods and six or eight transfer trains daily for handing over through wagons to the northern companies. A normal number of wagons dealt with daily is : 866 outwards ; 916 inwards ; and 398 transferred.

The following are the principal grades of the railway service employed, and the numbers of each at a recent date, though owing to the general slump in trade, and therefore in traffic, they are considerably below those of a normal period : clerks (male), 263 ; clerks (female), 15 ; inspectors, 7 ; foremen, 22 ; checkers, 92 ; loaders, 56 ; porters, 235 ; carmen, 102 ; lorry drivers, 23 ; vanguards, 108 ; shunters and capstanmen, 75 ; number takers, 13. There are, in addition, the employees of the Horse and Rolling-stock departments, attached to Bricklayers' Arms, though not to the Goods department. During the war period the numbers were very largely increased, and some hundreds of women were employed as porters, checkers, and on the vans, as well as in the offices.

Mr. W. A. BROWN.
Outdoor Assistant to London District Goods Superintendent, South Eastern & Chatham Railway.

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Naturally, not a great many men could be released for direct war service, but the Roll of Honour includes 168 names, and no fewer than 28 gave their lives.

Besides North Kent West and Mercer's Crossing, two other signal cabins, Nos. 2 and 3 are concerned with depôt working. Sixteen hydraulic capstans are provided in various places, and they are used for manipulating wagons in places not accessible by engines, for moving wagons singly or two or three at a time, and for forming outwards loaded wagons into station order. A 20-ton rail weighbridge is situated at Mercer's Crossing on what is known as the "Manure" road. A carriage dock is also available near the cattle pens for loading and unloading vehicles. The Outwards shed, outwards yards and traffic sidings, are lighted by electric arc lamps; gas is used in the Continental and Inwards sheds, the returned empties depôt, and in the offices and dining rooms.

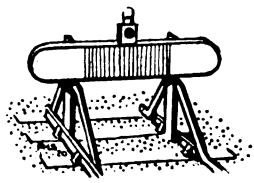
A feature of the traffic dealt with at Bricklayers' Arms is the amount of plate glass passing in sheets of considerable size and value. This is awkward to manipulate, and Mr. F. H. Marshall has recently introduced an ingenious trolley for its conveyance. It consists of a wheeled frame with standards carrying padded heads, which can be brought together by a screw action so as to grip a glass crate near the middle, the design being such that all tendency to tip over is prevented.

In conclusion, the writer is indebted to Mr. F. W. West, O.B.E., London District Goods Superintendent, under whom the working of South Eastern and Chatham Railway goods traffic has been so materially developed and improved during the last decade, and to Mr. Marshall, Goods Agent, for information used for this article, and for facilities to inspect and observe the working of traffic.

Mr. F. W. West, O.B.E., obtained his wide and unique experience in the working of goods traffic on the London and North Western Railway, and for several years was in charge of the Crewe Tranship Depôt until, in January, 1910, he came to London to take up the position of London District Goods Superintendent, South Eastern and Chatham Railway. Early in 1915, Mr. West was selected by the Government to reorganise the methods of handling stores, ammunition, &c., at Boulogne for our Overseas Forces, and in 1916 was appointed as railway expert to the visiting Port and Transit Committee, responsible for improving the turn round of ships at the Western Ports.

Mr. Brown, now Outdoor Assistant to Mr. West, was for several years Goods Agent at Bricklayers' Arms, but during the war was called upon to assist the R.E. forces in France in improving the methods of loading wagons. During his absence, Mr. Marshall was Acting Agent, and, when Mr. Brown received his present appointment, the former was, in November, 1919, confirmed to the position he now holds.

Mr. Marshall is still quite a young man, but the nine years he spent at Crewe Tranship depôt, London and North Western Railway, gave him a splendid training for dealing with complex goods traffic on a large scale. At Crewe he went through all sections, until he became personal clerk to Mr. West, who was the Goods Agent in charge. Soon after the latter came to the South Eastern and Chatham Railway, in January, 1910, Mr. Marshall followed his chief to assist him in the same capacity as before. In March, 1915, Mr. Marshall became Chief Clerk to the District Superintendent, going to Bricklayers' Arms as temporary Agent in July, 1917.



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VALE OF RHEIDOL RAILWAY TRAIN AT A ROADSIDE STATION.

2-6-2 Locomotive No. 1, "Edward VII."

The Vale of Rheidol Line, (Cambrian Railways).

By H. L. HOPWOOD.

FOR grandeur of scenery there is certainly nothing in Wales to compare with the Devil's Bridge, where meet the rivers Mynach and Rheidol. George Borrow, the author of "Wild Wales," called it "one of the most remarkable localities in the world." As this spot, "truly awful in its grandeur," is amply described in the several guides to Wales, further comment on our part is unnecessary.

Since 1902 a railway has connected Devil's Bridge with Aberystwyth. True, it is only a narrow-gauge line, but, from the scenic standpoint, it is the most interesting in Wales, traversing, as it does, the romantic Rheidol Valley. Opened for mineral traffic in August and for passengers on December 22, 1902, the Vale of Rheidol Railway existed as an independent company until July 1, 1913, when it was absorbed by its larger neighbour, the Cambrian Railways.

The line, 11 miles 60 chains in length, follows the Rheidol the whole way—at first on the north side, but at a point 2 miles from Aberystwyth it crosses the river by a low timber viaduct of seven spans and then runs along the south bank. For 4 miles or so the valley is fairly wide, but, as it gradually closes in, the railway takes to the hillside, and at the fifth milepost from Aberystwyth it commences to ascend in real earnest, a practically unbroken grade of 1 in 50 occurring for the next 6¾ miles to the terminus at Devil's Bridge, where an altitude of 680 ft. is attained.

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Apart from the main line, there is a short branch to the harbour at Aberystwyth, but this seems never to have been used. The gauge is 1 ft. 11½ in., the permanent way being formed of flat-bottomed rails weighing 50 lb. to the yard. The terminus at Aberystwyth is close to the Cambrian Railways station, but at right angles to it. On leaving Aberystwyth, the line describes almost a half circle, and then for about 1½ miles runs parallel with the Cambrian main line until the latter turns north towards Borth. The stations are unpretentious buildings of wood and corrugated iron. No platforms are necessary, as the carriage footboards are within a few inches of rail level.

Intermediate stations are provided at Llanbadarn, Glanrafon, Capel Bangor, Nantyronen, Aberffrwd, Rheidol Falls and Rhiwfron. Being only single track, with crossing places at Capel Bangor and Aberffrwd, the railway is worked on the electric tablet system. From Aberystwyth to Capel Bangor there is little of interest in the scenery, but, as the valley narrows, its steep slopes are seen to be covered with dense masses of foliage. Gradually the line rises until it is carried along a ledge cut out of the hillside, and, looking out on the left, the river Rheidol is seen hundreds of feet below. As the valley winds in and out it is closely followed by the ascending railway track, and for the remainder of the journey an almost continuous succession of double "S" curves is encountered, the sharpest of these being laid out on a three-chain radius. At Rhiwfron, on the opposite side of the valley, there is a lead mine, which is connected with the railway by an electrically-worked aerial cableway. Approaching Devil's Bridge terminus, the railway leaves the valley and reaches the station through a series of rock cuttings. Thus ends a journey through scenery the beauty of which is far beyond the power of our pen to describe.

For the opening of the railway in 1902, Messrs. Davies & Metcalfe, of Manchester, built two engines, which were Nos. 1 and 2 in the firm's books. They were 2-6-2 side tanks, No. 1, *Edward VII*, and No. 2, *Prince of Wales*. They have outside cylinders, 11 in. by 17 in., with steam chests above, the slide valves being driven by rocking shafts from the motion inside the frames. The six coupled wheels are 2 ft. 6 in. in diameter, the third pair being the drivers, and the rigid wheelbase is 6 ft. The boiler, 2 ft. 9 in. in diameter, provides a total heating surface of 420 sq. ft., and works at a pressure of 150 lb. These powerful little engines weigh 25 tons and haul trains of five bogie coaches and a four-wheeled brake van, but in the height of the season the load is often increased to six passenger vehicles.

Another engine was afterwards added to the stock. This was No. 3, *Rheidol*, a 2-4-0 side tank built by Messrs. W. G. Bagnall (No. 1497) in 1896, and obtained second-hand by the Vale of Rheidol Railway. It is a much smaller engine than the others, having cylinders 8 in. by 12 in., four coupled wheels of 2 ft. 2½ in. in diameter, a heating surface of 186 sq. ft., and a total weight of only 13 tons. The maximum load for No. 3 is two coaches and a van. During the winter months it is usually the only engine at work, for traffic is then light, and trains of one or two coaches and a van suffice to meet ordinary requirements. Advantage is taken of the winter season to overhaul the two larger engines in time for the summer traffic, when, in August, probably all three will be in steam, Nos. 1 and 2 for working the passenger service and No. 3 as spare engine.

All rolling-stock was built by the Midland Railway Carriage & Wagon Works, of Shrewsbury, and consists of 14 coaches, 3 passenger brake vans and 18 wagons. The third-class bogie passenger vehicles are divided into seven compartments, which each hold 8 passengers, so that the total accommodation is for 56 passengers. These coaches are 32 ft. long, 6 ft. wide and 8 ft. 6½ in. high from rail level. There are a number of "open" coaches, some of which are eight-wheeled and others four-wheeled. The brake vans are also four-wheelers. In spite of the limited gauge, it will be noticed that the coaches seat four passengers a side, or only one less than those of standard-gauge railways.

As previously mentioned, the line became part of the Cambrian system on July 1, 1913, but the new ownership has brought about little or no change. The only difference is that the rolling-stock is now painted in Cambrian colours —black for engines and bronze-green for coaches. The names have been removed

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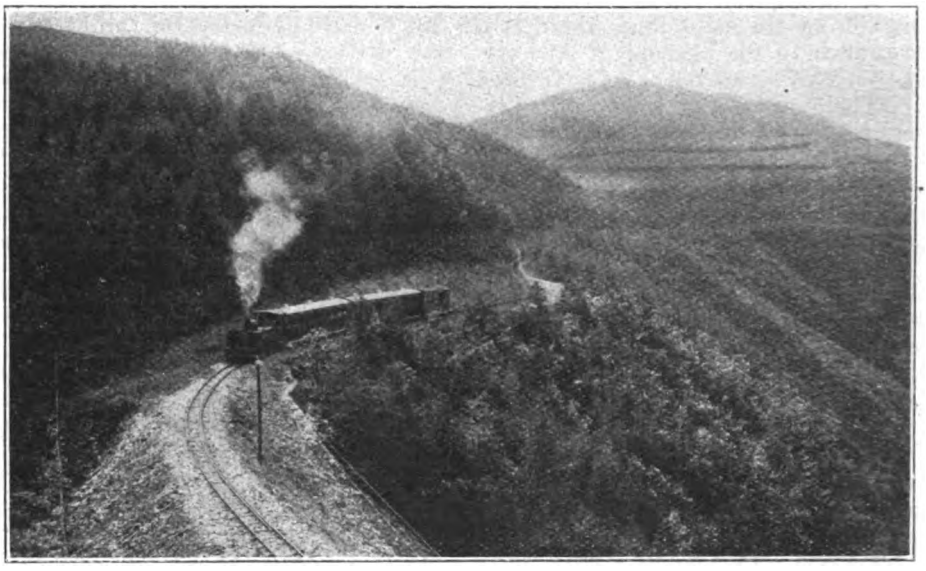
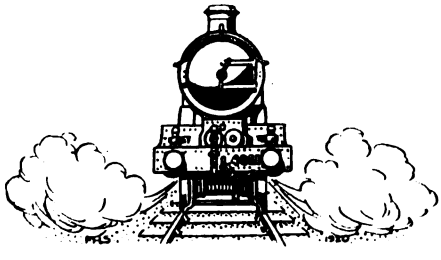


A PICTURESQUE SCENE IN THE RHEIDOL VALLEY.

from the engines, but the old numbers are retained, so, to that extent, the locomotive stock is still kept separate from that of the Cambrian Railways proper. At the time of our last visit to the railway, No. 2 engine had just been returned from Oswestry Works, where it had been altered by having the footplate widened 12 in. This engine was then painted lead colour, but No. 3 was black, and had the title "Cambrian Railways" on the tank sides. When first built, No. 1 was coloured yellow, No. 2, medium green, and No. 3 dark green. Likewise, the passenger stock had green underframes and bodies grained and varnished.

Goods and mineral traffic is extensive, as, apart from the product of Rhiwfron lead mines, a good deal of timber is cut and sent down the line, for use as pit props, etc. The latter traffic was heavy during the war, but we were pleased to see that the Rheidol Valley had not been denuded of trees to the same extent as other parts of Wales. At Dinas Mawddwy, for instance, the hillside had been rendered practically bare so early in the war as 1915. At Aberystwyth facilities for transferring goods traffic between the narrow-gauge Vale of Rheidol and the standard-gauge Cambrian Railways have existed since the opening of the former.

Passenger traffic has always been subject to road competition, but those who know both road and rail routes to Devil's Bridge much prefer the latter on account of the finer views. In the summer months there are five up and four down trains, with an extra trip each way on Mondays and Saturdays. The journey occupies 70 min. in going to Devil's Bridge and 60 min. in returning to Aberystwyth.



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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst. T., A.I.Loco.E.

Photo.] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.
New 0-6-2 Suburban Tank Locomotive, No. 1727.

CONFIRMATION of the remarkable capabilities of the new Great Northern 0-6-2 superheated suburban tank engines, concerning which I had something to say last month, is forthcoming from a correspondent who has made a close study of their performances. The figures as to running mentioned by me were the outcome of one or two random observations, but my friend has timed a number of runs in detail, of which two at least are well worthy of publicity. Both were made on the 6.19 p.m. train from King's Cross to Potter's Bar, which runs non-stop from Finsbury Park to Wood Green, and from there again to New Barnet, 5 min. being allowed to clear Wood Green on the former run, and 9 min. thence to clearing New Barnet—say, 4½ and 8½ min. running times respectively, start-to-stop, for stages of 2·5 and 4·2 miles. Parenthetically, I wonder how many readers have noticed the extraordinary tightness of many of the suburban train times on the Great Northern Railway main line; the first-mentioned of the two bookings above is a case in point, whereas in the up direction such times to Finsbury Park as 6 min. for the 3·9 miles from New Southgate, 11 min. for the 8·1 miles from Hadley Wood, or 13 min. for the 10·2 miles from Potter's Bar, in all cases start-to-stop, are of a smartness which would want a lot of beating anywhere round London, even allowing for the favourable grading of the route concerned.

To return to my friend's two runs, engines Nos. 1756 and 1739, hauling trains of approximately 170 tons gross weight from Finsbury Park, passed Hornsey, 1·5 miles, in 3 min. 2 and 5 sec., and reached Wood Green, 2·5 miles, in 4 min. 19 and 25 sec. Re-starting up the 1 in 200 which extends continuously on from Wood Green to Potter's Bar, and despite shutting off steam for the repairs to Wood Green tunnel, the former engine accelerated against the grade to all but 47 and the latter to a shade under 46 m.p.h. before passing Oakleigh Park, 3·4 miles distant! New Southgate, 1·4 miles, was passed in 3 min. 24 and 22 sec., Oakleigh Park, 3·4 miles, in 5 min. 22 and 26 sec., and New Barnet, 4·2 miles, was reached in 6 min. 35 and 39 sec., representing nearly 2 min. clear gain on schedule in this short distance in each case. My friend rightly says of these achievements that they are "a decided novelty to the traveller who knows the Great Northern Railway only from the standpoint of its

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express engines and train running." Further than that, I should imagine that a Great Northern Railway "Atlantic," with its larger driving wheels and limited adhesion weight, would be incapable of achieving such times, although doubtless a "Mogul" could equal them, if put to it.

The chief moral of these runs, however, appears to be the amazing effect that superheating has upon locomotive performance. As I pointed out last month, the difference between the new and the old 0-6-2 tanks on the Great Northern Railway is principally one of appearance, as, apart from the addition of superheating equipment in the new series, with the customary accompanying enlargement of cylinders and provision of piston-valves, the leading dimensions are practically unchanged. It is therefore to the superheat that the revolution in performance must be attributed. This is by now a story familiar enough—the truth was emphasized again by the work of the rebuilt and superheated Lancashire and Yorkshire 4-cylinder 4-6-0 engines detailed in my last article—but in the work of the Great Northern Railway 0-6-2 engines we have also a refutation of the one-time theory that superheating would prove of little or no value unless the locomotives concerned worked for considerable periods under continuous steam, as on lengthy express runs. Experience seems to prove, indeed, that there is practically no locomotive type extant, with the possible exception of the shunting tank, that fails to benefit both in its performance and in reduced fuel and water consumption by the application of the principle of superheat, with the usual accompanying modifications of design, such as cylinder enlargement.

Another "myth," comparable to that referred to in the last sentence but one, has, to me, been disposed of finally by some recent experiences which I have enjoyed behind the Midland 4-4-0 compound engines now superheated, and which are detailed in the accompanying tables. The contention to which I refer is that superheating should be looked upon as an alternative and simpler method of securing all the economies in fuel and water consumption rendered possible by compounding on locomotives One may say without much fear of contradiction that it was largely on a ground such as this that the minds of British locomotive engineers generally were diverted, on the widespread introduc-

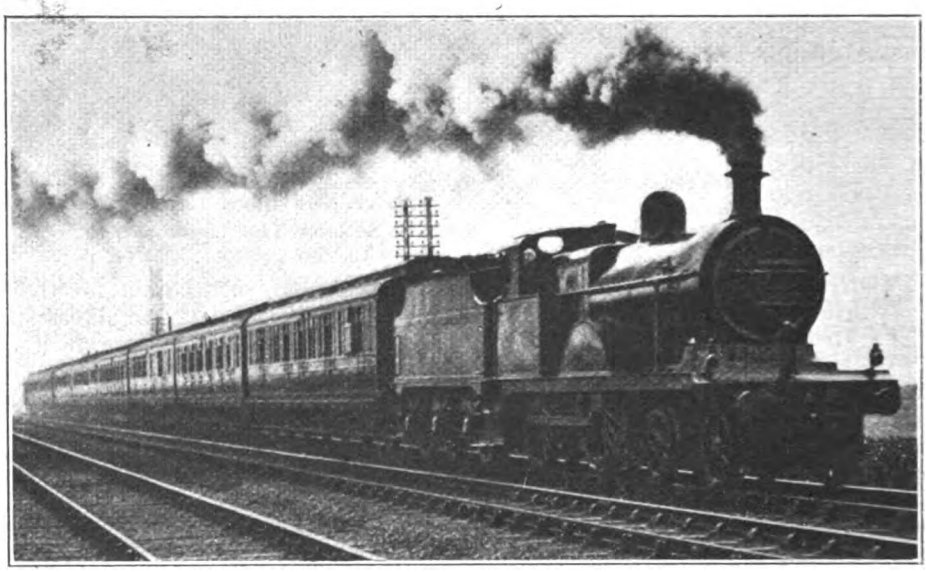

Photo.] **MIDLAND RAILWAY.** [*Henry L. Salmon.*

Down Scotch express near Leicester. 4-4-0 locomotive, No. 711 (Class 3).

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tion of the principle of using highly superheated steam, from the compound principle, which by reason of its success on the Midland Railway—the first really successful application on a large scale in this country, as the Webb and Worsdell-von Borries systems were technically faulty and correspondingly inefficient—was then coming prominently under review. But the exhaustive experiments made just prior to the war by M. Maréchal, the chief locomotive engineer of the Paris, Lyons and Mediterranean Railway of France, proved practically without question that superheating ought to be regarded, not as an *alternative* to, but as an *ally* of, compounding. I have given details previously in these columns of the experiments referred to, and need not therefore recapitulate them. Briefly, by building a number of large 4–6–2 express engines identical in design in all respects save that one series had four simple cylinders of equal diameter and the other series was composed of four-cylinder compounds, both being superheated, he found that the superheated compounds showed an average economy of 25 per cent. in fuel and 31 per cent. in water consumption, while working trains of equal weight at average speeds higher by 2·3 m.p.h., over the superheated simples.

These results, which led M. Maréchal to convert the series of 4-cylinder simple 4–6–2 engines to the compound arrangement, so that the whole of these large locomotives are now working as superheated compounds, are confirmed by performances of the superheated Midland compound engines about to be described. The first table shows a series of three runs on the 12.20 p.m. express from Carlisle to Leeds, with loads which were, in proportion to the comparatively high booked speeds and difficult intermediate grades, distinctly heavy; non-super-

MIDLAND RAILWAY. CARLISLE—LEEDS.

Train engine, 4-4-0 compound	No.	1007	1027	1028
Pilot to Ais Gill—				
4-4-0 superheated, rebuild	No.	433	444	463
Load—				
Tons, tare		274	275	302
Tons, full		290	295	325

Distance. Miles.			Schedule. Min.	Min. sec.	Min. sec.	Min. sec.
0·0	Carlisle	dep.	0	0 00	0 00	0 00
2·7	Scotby	pass	—	6 00	6 00	5 55
10·0	Armathwaite	,,	—	16 05	15 50	15 55
15·5	Lazonby	,,	21	22 00	21 45	21 45
19·8	Langwathby	,,	—	26 20	26 20	26 05
24·7	New Biggin	,,	—	31 55	32 00	31 35
30·8	Appleby	,,	39	39 10	39 15	38 30
33·3	Ormside	,,	—	41 45	41 55	41 10
38·3	Crosby Garrett	,,	—	48 50	49 10	48 35
41·5	Kirkby Stephen	,,	—	53 30	54 00	53 15
48·4	Ais Gill Summit	arr.	pass	65 15	66 15	65 15
	(Pilot detached)	dep.	60	65 55	67 25	66 10
51·4	Hawes Junction	pass	—	71 50	72 55	71 40
59·6	Blea Moor Box	,,	81	81 55	82 35	81 40
65·5	Horton	,,	—	87 30	87 55	87 00
73·5	Settle Junction	,,	—	95 25	94 30	94 00
						sigs.
76·8	Hellifield	arr.	99	99 25	98 15	99 30
0·0		dep.	0	0 00	0 00	0 00
					sigs.	
3·4	Bell Busk	pass	—	7 15	10 25	7 05
10·0	Skipton (slack)	,,	13	14 25	18 30	14 05
19·2	Keighley	,,	24	25 35	29 40	24 40
					p.w.r.	
25·3	Shipley N. Junction (slack)	,,	32	32 10	39 20	31 25
33·0	Kirkstall	,,	—	41 50	48 00	41 00
36·2	Leeds	arr.	46	47 25	53 30	46 35

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heated compounds were employed in each case, and, despite the provision of the usual piloting assistance to Ais Gill in the case of loads in excess of 240 tons, there was little or no time in hand on the journey. From Leeds to London the same train, with exactly equal loads on all the three runs, was taken forward on one occasion by a non-superheated compound, and on the other two by compounds now superheated The non-superheater as will be seen in the second table, kept time to Clay Cross, and gained time thence to Trent, where the time-table allowance for reduced speed over the various colliery subsidences is perhaps a little over-generous; from Trent to London, however, the load was too much for the engine, and time was lost to the tune of 7 min. On the other hand, the superheated compounds appeared to play with their loads, and despite running which degenerated at times into a palpable "spinning out" of schedule, there was always time in hand, while the aggregate gains on booked time even then amounted to some 13 or 14 min. And this was with 44-axle trains, of tare weight from 14 to 16 tons in excess of the maximum rating of 260 tons allowed to engines of Class 4 on the fastest Midland trains over this route.

We will commence with the work of the non-superheated engines at the northern extremity of the journey, shown in the first table. It would be difficult, in the first place, to find three runs exhibiting a more extraordinary uniformity of times than these up to Ais Gill, especially in consideration of the fact that no less than six engines and their crews are concerned. Further, it is worthy of note that the route traversed is one of very heavy gradients, on which, more than on any other kind of course, variation in driving is usually displayed in the greatest possible degree. But here, for 20 miles from the start we have no greater variation in running times than 15 sec; after 40 miles the maximum difference had only risen to 45 sec; while, on stopping at the summit, the engine on the slowest run had only taken one minute more than those responsible for the fastest trips Route considered, such figures are in my experience unique, and bespeak a praiseworthy exactitude of driving and firing method on the part of all the engine crews concerned.

Out of Carlisle, after a first mile-and-a-quarter that is falling at the immediate start and thenceforward level, there ensue 6¾ miles rising at an average inclination of 1 in 132—curiously enough, a grade almost

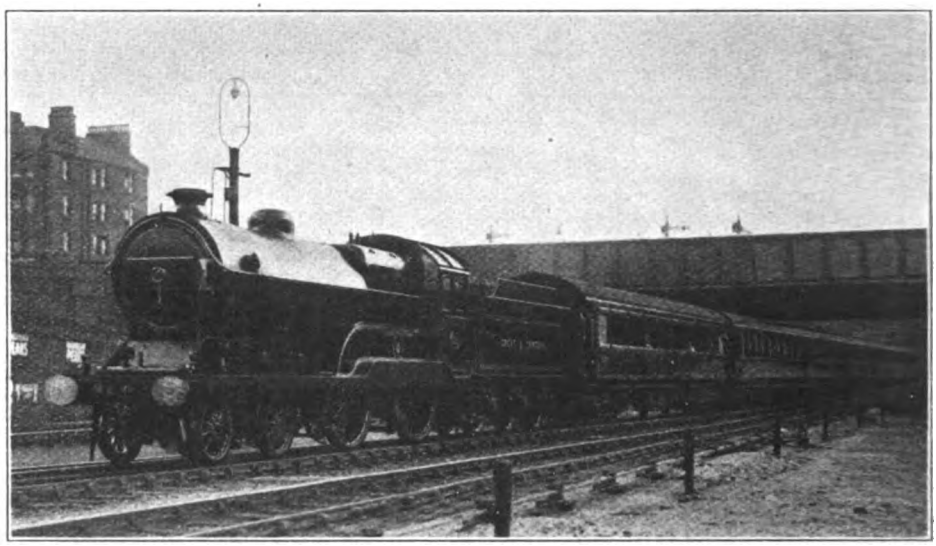

Photo.] GREAT CENTRAL RAILWAY. [*F. E. Mackay*

Manchester express leaving Marylebone. 4-4-0 superheater locomotive, No. 506, "Butler-Henderson."

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identical with that from Carlisle to Wreay, on the London and North Western main line—to a point two miles short of Armathwaite. Then follow 9 miles of sharp undulations, beginning with a mile down at 1 in 132, on which the maxima were 57½, 60 and 58½ m.p.h., and concluding with 1½ miles down at 1 in 165, just before Lazonby, on which our speed reached 65, 61½ and 66 m.p.h. In view of Scotby bank, an allowance of only 21 min. for the 15·5 miles to Lazonby is very much on the tight side, although even on the run which started the most slowly we only exceeded it by a minute, and were practically on time again at Appleby. The Lazonby-Appleby stretch is almost exclusively adverse, although mainly at such

MIDLAND RAILWAY. LEEDS—LONDON.

Engine, 4-4-0 compound .. .. No.			1002 Super.	1008 Super.	1027 Non-sup.
Load—					
Tons, tare			275	275	276
Tons, full			295	295	295
Distance. Miles.			Schedule. Min.	Min. sec.	Min. sec.	Min. sec.
0·0	Leeds	dep.	0	0 00	0 00	0 00
				p.w.r.		
6·0	Woodlesford	pass	—	11 50	9 10	10 05
10·9	Normanton (slack)	,,	17	17 10	14 25	15 50
18·7	Royston	,,	—	28 45	25 40	27 15
20·9	Cudworth	,,	29	31 00	27 55	29 45
28·9	Swinton	,,	—	38 25	35 45	38 35
34·0	Rotherham	,,	45	43 45	41 20	44 20
41·7	Killamarsh	,,	—	53 00	50 05	53 25
49·1	Tapton Junction (slack)	,,	—	61 25	58 45	62 30
49·8	Chesterfield	,,	65	62 35	59 45	63 25
53·8	Clay Cross (slack)	,,	70	68 20	65 25	69 15
				sig. stop	sig. stop.	p.w.r.
62·5	Pye Bridge (slack)	,,	89	86 05	83 55	84 25
				p.w.r.	p.w.r.	p.w.r.
70·8	Trowell (slack)	,,	100	98 55	95 25	96 20
76·2	Trent Junction	arr.	109	107 55	105 15	105 25
0·0		dep.	0	0 00	0 00	0 00
3·5	Kegworth	pass	—	6 40	6 45	6 55
8·3	Loughborough	,,	—	11 45	12 10	12 55
16·0	Syston	,,	—	20 10	20 25	22 25
					sig. stop.	
20·7	Leicester	arr.	26	25 45	27 45	28 15
0·0		dep.	0	0 00	0 00	0 00
3·7	Wigston	pass	—	6 45	6 35	7 00
9·3	Kibworth, North Box	,,	—	13 40	13 45	15 05
16·1	Market Harborough (slack) ..	,,	21	20 20	20 10	22 30
20·6	Desborough North Box	,,	—	28 00	27 15	30 55
27·1	Kettering	,,	34	35 05	33 45	38 10
34·0	Wellingborough	,,	41	42 10	40 15	44 45
39·3	M.P. 59¾ Summit	,,	49	49 00	46 00	51 55
				sigs.		
49·2	Bedford	,,	60	59 35	55 40	62 35
				p.w.r.		
57·3	Ampthill	,,	—	71 20	64 10	72 30
66·3	Leagrave	,,	—	82 15	76 10	84 45
68·8	Luton	,,	84	84 50	79 35	87 45
74·4	Harpenden	,,	—	90 30	86 10	94 10
79·2	St. Alban's	,,	96	95 15	91 10	99 20
					sigs.	
86·6	Elstree	,,	—	102 45	99 45	107 20
92·1	Hendon	,,	109	108 00	106 05	113 10
97·6	Kentish Town	,,	—	114 20	112 45	120 00
99·1	St. Pancras	arr.	118	117 10	115 50	122 45
196 0	Total net times (min.)		253	240	239	255½

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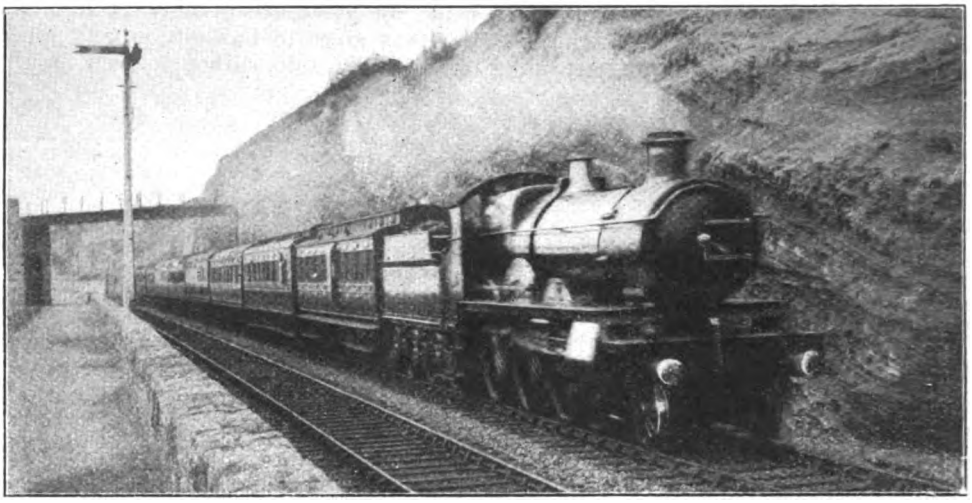

Photo.] GREAT WESTERN RAILWAY. [*T. E. Norman.*

West to North express near Dawlish. 4-6-0 locomotive, No. 2982, "Lalla Rookh."

gentle grades as 1 in 332, 444, 710, etc. (except for 1½ miles up at 1 in 121 near Appleby); but the average speeds from Lazonby to Appleby ranged between the excellent figures of 52·5 (No. 2) and 54·8 (No. 3) m.p.h. The 1¼ miles down at 1 in 183 between Appleby and Ormside, following some 1¾ practically level miles through Appleby itself, are a welcome "breathing space" for up trains; on the descent in question our respective maxima were 62½, 62 and 61 m.p.h. Last of all come no less than 15 miles of continuous up gradient, nearly all in the neighbourhood of 1 in 100, save for 2 miles at 1 in 162-215 to Crosby Garrett Station with a subsequent mile nearly level, and a mile later on past Mallerstang Box at 1 in 302. Our final minima before shutting off steam for the Ais Gill stop were 31½, 34 and 33 m.p.h.

Chief honours, of course, go to engines Nos. 1028 and 463, as with a load heavier by one coach than those on either of the preceding trips, and totalling 11 vehicles, or 48 axles, they tied for the best time of 65¼ min. with Nos. 1007 and 433. This represented a gain of 3¾ min. on schedule, although the latter is obviously framed for unpiloted engines, not stopping at the summit, or, alternatively, allows for the duration of the stop in the case of piloted trains detaching the pilot. It is worth noting that these times of 65¼ min. for a journey of 48·4 miles involve a throughout average speed of no less than 44·5 m.p.h., what time the trains are being lifted from a level of 66 ft. at Carlisle to one of 1,166 ft. at Ais Gill—a clear difference of 1,100 ft., representing an average adverse grade throughout of 1 in 233. Even with all allowance for piloting, this is fine work with a load of 325 tons. A London and North Western train, maintaining the same average speed out of Carlisle, would need to reach Shap Summit in a shade over 40 min., although I grant that the "lift" of 848 ft. in this shorter distance of 31·3 miles means a somewhat steeper average grade of 1 in 195 from start to finish.

The usual lightning stops at Ais Gill Box sufficed for "dropping the pilot"; in fact, No. 1007 had got under way again before the road was quite clear, and thereby lost about ½-min. in starting. After the favourable start to Hawes Junction, the grades are slightly against the engine for some 7 miles, to the south end of Blea Moor Tunnel, where the altitude is but little inferior to that of Ais Gill Box itself. This explains the somewhat moderate times from Ais Gill to Blea Moor, the best being No. 1027's 15 min. 10 sec. for the 12·2 miles. The same engine displayed much the fastest running on the subsequent steeply-falling stretch of 15 miles on

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to Settle Junction, the speed being mostly at or about 75 m.p.h. below Horton, while at Settle Junction it rose finally to 77½. The driver of No. 1007 was exceptionally cautious, however; we got up to 69 m.p.h. beyond Horton and then actually slacked to 53, but touched 72½ below Settle. The result of this somewhat timid running was a slight loss on schedule. No. 1028 made an average descent, maintaining 71½ m.p.h. for most of the distance below Horton, and would have reached Hellifield in slightly under 98 min. but for the concluding delay. The fastest trip from Ais Gill was, of course, that by No. 1027, the 28·4 miles being covered in 30 min. 50 sec., start-to-stop, while the 13·9 miles from Blea Moor Box to Settle Junction occupied only 11 min. 55 sec.

From Hellifield to Leeds a booking of 46 min. for the 36 miles is not so easy as might appear, as the start is for over 1½ miles adverse at 1 in 215–350, and subsequently, although the tendency of the grading is mostly with the engine, there are severe slacks at Skipton and Shipley, and a very slow approach to Leeds. No. 1007 touched 67 m.p.h. on the favourable grades down to Skipton Junction, where speed was reduced with such vigour that it fell to 32 m.p.h. Down the 1 in 223–290 from Keighley to Saltaire the speed was poor, not exceeding 61 m.p.h., and on the similar grades after the Shipley slack we did not recover to more than 61½ m.p.h. In this way the loss from Hellifield to Leeds was nearly 1½ min. No. 1027 was unfortunate in being stopped for signals at Hellifield Goods, immediately after starting, for 2 min., although why this should cause the driver to descend the major part of the ensuing bank at 53–55 m.p.h., and to slacken to 24 m.p.h. over Skipton Junction, passes my comprehension. We kept time from Skipton to Keighley, and then followed the severe p.w.r. check at Bingley, causing a further loss; after this, however, things did improve, and with a maximum of 66 m.p.h. at Kirkstall No. 1027 was the only engine to keep time between Shipley and Leeds. The time-book, by the way, gives no enlightenment as to where the passing time at Shipley really applies; my own times, as will be seen, were taken at the North Junction. Owing to the extra weight of the train, No. 1028 was assisted in rear from the start at Hellifield, and made a better run, with no exceptional features, losing only 35 sec. on the booking to Leeds. But it would seem that in the running from Carlisle to Leeds, with loads such as these, even the compounds, while still lacking superheater equipment, have

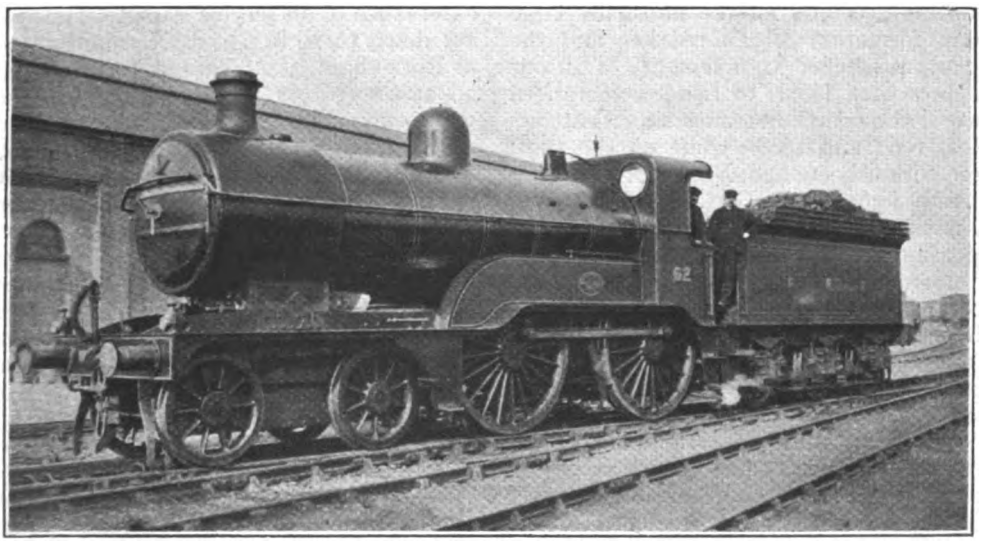

Photo.] GREAT NORTHERN RAILWAY. [*J. Macartney Robbins.*

4-4-0 superheater locomotive, No. 62, at Cambridge.

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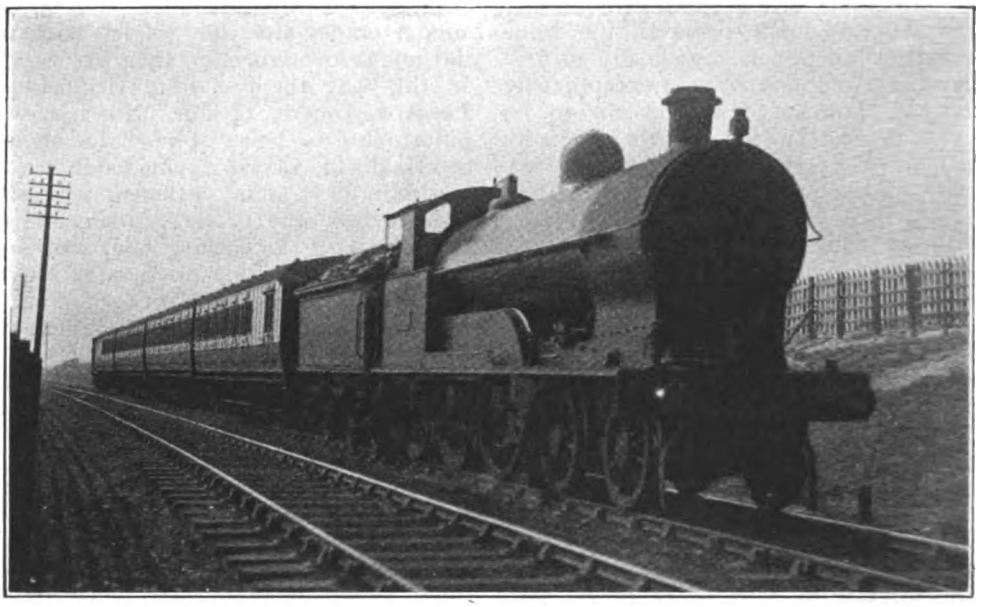

Photo.] **LONDON & NORTH WESTERN RAILWAY.** [*G. W. Smith.*

Manchester–Leeds train running over L. & Y. line near Clayton Bridge.
Superheated 4-6-0 locomotive, No. 307.

little or no margin in hand in the matter of time.

But south of Leeds things were very different. By the removal of one coach on the third run all the trains became of precisely the same weight (coal strike working accounts for the unusually large train formation of ten coaches and the heavy passenger complement), and our engines from Leeds to London comprised two of the compounds now superheated—Nos. 1002 and 1008—while on the third run, curiously enough, No. 1027, which has already figured from Carlisle to Leeds, and is not superheated, appeared again. The booking from Leeds to Trent—76·2 miles in 109 min.—may appear unduly generous; as far as Clay Cross, however, it includes the very severe slacks at Normanton and Tapton Junction, followed in each case by lengthy subsequent ascents (and it is also customary to moderate the speed through Rotherham), while the remainder of the distance to Trent is a succession of drastic slowings on account of subsidences over colliery workings. The evidence of the runs, however, is that 19 min. is too ample an allowance for the 8·7 miles from Clay Cross to Pye Bridge, while 17 min. is over-generous from Leeds to Normanton, whereas 12 min. from Normanton to Cudworth and 5 min. from Chesterfield to Clay Cross are impossible times with these loads.

The principal feature of No. 1002's running was an exceedingly scrupulous observance of all service slacks. Thus we got down to 16 m.p.h. at Normanton, 29 at Rotherham, 30 at Tapton Junction and 26 at Clay Cross! In consequence, the times immediately subsequent to each slack suffered somewhat in comparison with those of No. 1008, but elsewhere the work was just as good, and in parts even better. Owing to the initial p.w.r. delay, we did not get above 60 m.p.h. at Methley, but at Darfield we were doing a sustained 67 m.p.h. Very fine work was performed after we had recovered from the Rotherham slack, our speed up the rising grades from Killamarsh to Tapton, which average 1 in 350, only falling from 57 to 53 m.p.h., prior to the slack. Net time to Chesterfield, notwithstanding the excessive severity of the service slacks, was only 60 min. for the 49·8 miles, or 5 min. under schedule; net time from Leeds to Trent, allowing for the Hunslet p.w.r. check, the Alfreton signal stop, and the extra checks over and above schedule allowance between

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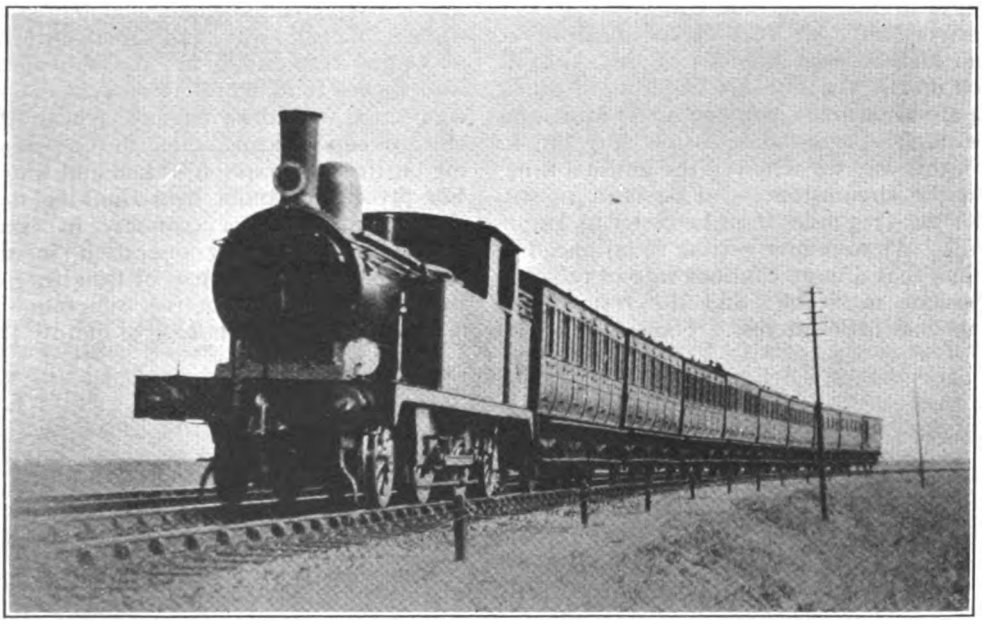
Pye Bridge and Trent, I have reckoned at 100½ min. Between Trent and Leicester, where there are 11 miles of grades at or about 1 in 500 adverse to the engine in this direction, the remainder being level, we touched 61½ m.p.h. at Loughborough, and just kept time with ¼-min. in hand.

On No. 1008's run the slacks were of a normal character, and the intermediate running was so good that by the time we reached Chesterfield we had no less than 5¼ min. in hand. We touched 62½ m.p.h. at Methley, and 65 between Cudworth and Darfield, while the time of 18 min. 25 sec. for the 15·8 miles from Rotherham up to Chesterfield was again an unusually good one. Net time from Leeds to Trent in this case was about 100 min. At Loughborough we touched 60 m.p.h., and should have reached Leicester in exactly 26 min. but for being checked outside. No. 1027 was just on the right side of time at Clay Cross, but the intermediate service slacks were negotiated at higher speeds than on both the preceding journeys, and the unduly easy timing thence to Trent, to which I have referred previously, enabled a gain of 3½ min. on schedule to be registered on arrival. But from Trent to Leicester the non-superheated engine lost a clear 2¼ min.

Lastly we have the most interesting stretch of all, from Leicester to London. Here the superiority in working of the superheated engines was most marked. The punctilious observance of slacks was again a feature of No. 1002's work, and the downhill running was very moderate, except at East Langton (why is it that drivers of compounds on up Midland expresses generally "let themselves go" to a greater extent at this point than anywhere else on the journey?), where we touched 72½ m.p.h. Descending past Kettering, however, we did not exceed 62½ m.p.h., and on St. Alban's bank 64½ m.p.h. was the maximum, whereas at Sharnbrook and Hendon the figures were in both cases 69 m.p.h. But the uphill work was excellent throughout; at Kibworth North, after an almost unbroken rise from Leicester finishing with 1½ miles at 1 in 199 and 1½ at 1 in 159, we were doing 47½ m.p.h.; at Desborough North, after 4 miles at 1 in 132, commencing with the Market Harborough slack to 40 m.p.h., the rate was 33 m.p.h.; the 4-mile bank to Sharnbrook Summit, 1½ miles at 1 in



GREAT EASTERN RAILWAY.

Down Cheshunt train on Clapton curve. 2-4-2 tank locomotive, No. 72.

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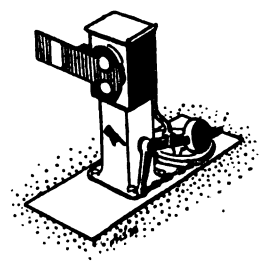
163-192 and 2½ at 120, produced a minimum of 36 m.p.h.; and after 6¼ continuous miles at 1 in 202 from Flitwick up to Toddington the speed was 47½ m.p.h.—a first-class achievement with nearly 300 tons behind the tender. Net time from Leicester to St. Pancras, as nearly as I can estimate, was 113¾ min., and from Kettering 78¾ min.

But the finer features all belong to No. 1008's run from Leicester to London, between about Market Harborough and Ampthill. Before the former we fell to 45 m.p.h. at Kibworth North, and touched 72½ at East Langton; then we only fell from 40 to 35 m.p.h. in the ascent to Desborough North, and, after restraining ourselves to the modest maximum of 69 m.p.h. through Kettering, we actually went up to Sharnbrook Summit with no lower minimum speed than 41½ m.p.h.—a brilliant feat. Keeping again to the modest figure of 72½ m.p.h. as the maximum in descending to Bedford, we nevertheless succeeded in curtailing by 5 sec. the pre-war "crack" time of 22 min. by the 105 min. Leicester-London expresses over the 22·1 miles between Kettering and Bedford—and with a tare load 35 tons in excess of the rating for Class 4 engines on those trains. Not content with this, our driver, after we had passed Bedford at no higher speed than 65 m.p.h., took us on up the 8·1 miles to Ampthill, of which 4 are at or about 1 in 200, in 8½ min., and without speed falling below 46½ m.p.h. In this way we achieved the unusual time, in the circumstances, of 64 min. 10 sec. for the 57·3 miles from Leicester to Ampthill. We were now getting so far ahead of time that a more cautious rate of progress became inevitable, and the rest of the run had little interest. Some idea of the extent of the subsequent "easing" is afforded by a comparison of 1008's and 1002's times between Ampthill and Harpenden. Net time to London on this run was 113 min., but obviously a continuation of the initial effort might have landed us in London in under 110 min., and even so without unduly high speeds downhill. Indeed, the best times taken from the two runs give a total time of 109 min. 20 sec. from Leicester to London, 76 min. 20 sec. from Kettering and 54 min. 25 sec. from Bedford. Whereas even before the war the same train was allowed 115 min. between Leicester and St. Pancras.

Between such work and that of the non-superheated No. 1027 there is little or no comparison. The latter fell to 41 m.p.h. at Kibworth North, 30 at Desborough North, and 43 at Ampthill, while the utmost that could be done in the way of maximum speeds was 65 m.p.h. before Kettering. Thus, with no marked easing of the engine at any point, and no delays, there was a loss of 4¾ min. on schedule from Leicester to London. Even granting as we may that this last run was hardly up to the average performance level of the Midland compounds, there is a disparity between the work of the non-superheated and the superheated engines far too great to be explained away, and superheating is of course responsible for the difference. One wishes that figures were available in connection with these engines showing the effect of superheating added to compounding on the consumption of fuel and water. For myself, I cannot help thinking that the urgent need for economy in every particular of railway operation in the future is bound in course of time to give the question of locomotive compounding in this country a fresh lease of life.



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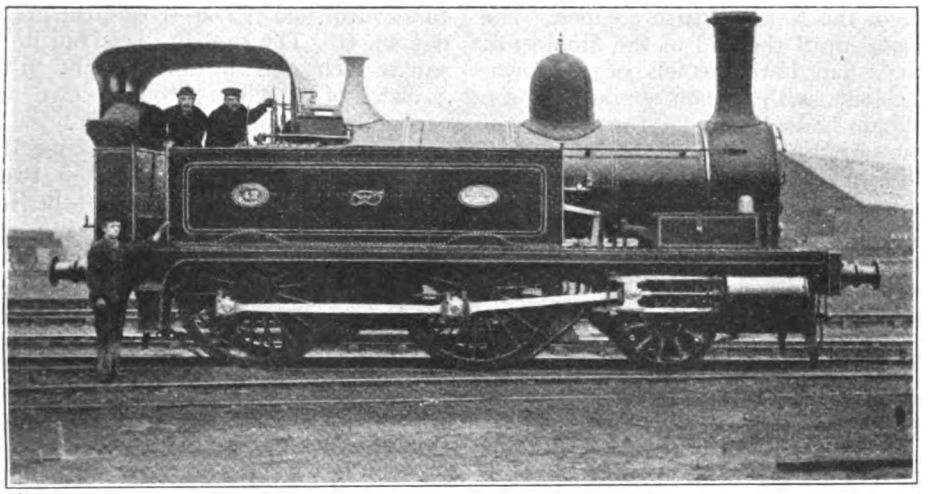
Locomotive and Train Working in the latter part of the 19th Century.

NORTH STAFFORDSHIRE RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

ALTHOUGH there were a number of passenger tank engines, the North Staffordshire worked a number of branch lines with old tender engines, many of which had outside cylinders. They were somewhat clumsy-looking engines, and were scrapped between 1880 and 1885. There were, however, three classes of passenger tank engines which were well known on the line. The first consisted of the two engines, Nos. 1 and 2, the latter being illustrated last month on page 320. These are particularly interesting as they were the first engines delivered to the North Staffordshire in 1848, and were originally tender engines of the well-known Sharp Brothers type, with 5-ft. 6-in. wheels and 15 in. by 20 in. cylinders. Many years afterwards they were rebuilt as saddle-tank engines, and between 1880 and 1890–91, when they disappeared, were stationed at Burton-on-Trent to work the branch trains to Tutbury, which made connections there with the Derby and Stoke main line trains.

The second class consisted of five outside cylinder 2-4-0 side tank engines, which worked almost exclusively over the "loop line" between Stoke, Tunstall and Kidsgrove. Nos. 12, 41 and 42 were built in 1874 by Sharp, Stewart & Co., and Nos. 9 and 11 came out at about the same time from Stoke works. All had 5-ft. 6-in. wheels. Nos. 9 and 11, which were rebuilt in 1894, remained as 2-4-0 engines, but the three others, which Mr. Longbottom rebuilt in 1899, were enlarged to 2-4-2 engines by the addition of large coal bunkers and radial trailing axles. These are, I believe, still at work on the duplicate list, and engaged on the same services over the "loop line."



2-4-0 TANK ENGINE, No. 42.
Built by Sharp, Stewart & Co., 1874. Coupled wheels, 5 ft. 6 in. diam.
Cylinders, 16 in. by 24 in.

The third class consisted of the earliest

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of the 2-4-0 side tanks, a type which afterwards became standard on the North Stafford. The first lot of these engines, which were designed by Mr. Clare, the chief locomotive superintendent of the company from 1876 to 1882, were Nos. 6, 8, 31, 51 to 53, all built at Stoke from 1878 to 1880. The coupled wheels were only 4 ft. 7 in. diam, and the cylinders 16½ in. by 24 in. These engines were generally to be seen on local trains in the Stoke district.

The colour of the North Staffordshire engines before Mr. Longbottom took over the superintendency of the locomotive department in 1882, was bright green, but Mr. Longbottom altered the colour to a gamboge brown, not very unlike the similar colour of the North British engines. The carriages, until the end of the nineteenth century, had lower panels of a brown-red colour with cream upper panels. The cream had a habit of "turning sour" in the atmosphere of the "Potteries," and the hue which it frequently assumed cannot be described, as it does not exist in the painters' pharmacopœia.

The goods tender engines were of three main classes, double and single framed. The double-framed engines, 24 in number, had 5 ft. wheels and cylinders 16½ in. by 24 in., though a number had 16 in. cylinders. These engines, which were mostly built by the firms of Hudswell & Clarke, Neilson, and the Worcester Engine Company between 1864 and 1867, bore in their early days a very strong resemblance to Mr. Sturrock's Great Northern goods engines of that period. The second type had the same general dimensions, but the frames were inside the wheels. Of these about half-a-dozen were built at Stoke about 1874-5, ten came from the Vulcan Foundry in 1872, and six were built by Beyer, Peacock & Co. in 1874. The Vulcan Foundry engines, when originally built, had Dodds's wedge motion. Finally, there were eight single-framed engines by Sharp, Stewart in 1873-4, of the same type as those built by that firm in large numbers for the Furness and Cambrian railways. The wheels of these engines were only 4 ft. 6 in. diam., and the cylinders 16 in. (afterwards enlarged to 16½ in.) by 24 in.

The old "Jenny Lind" type singles were nearly all broken up in 1882-4, except two, which lasted until 1886, and as they had done a good deal of main line work it became necessary to replace them with tender passenger engines, of which the company did not possess many. Two 2-4-0 engines were, therefore, built at Stoke in 1882, Nos. 54, *John Bramley Moore*, and 55, *Colin Minton Campbell*. They were the only two engines on the line which bore names, for two more of the same class, Nos. 45 and 46, built in Mr. Longbottom's time in 1884, were nameless. These four engines have 6 ft. wheels, and the cylinders were then 16½ in. by 24 in., though since enlarged to 17 in. diam. The leading wheels are 4 ft. in diam. The total heating surface was originally only 821½ sq. ft., of which the tubes furnished 722 sq. ft. and the firebox, 99½ sq. ft. The pressure was 140 lb. per square inch, and the total weight 36 tons 3 cwt., of which 25 tons 9 cwt. were carried by the coupled wheels.

In spite of their very small size these four engines were for more than twenty years the crack express engines of the North Staffordshire Railway. They were stationed at Stoke, and ran both between Stafford and Manchester on the south and north line, and between Derby and Crewe on the east and west line. They regularly worked the heavy London & North Western 12 noon London express from Manchester to Stoke, more detailed mention of which will be made below.

Mr. Clare's type of 2-4-0 tank engine was continued from 1881 to 1895. A few of the early engines of 1881-82, built at Stoke before Mr. Longbottom took charge, had 5 ft. wheels, but most of those turned out afterwards had 5 ft. 6 in. wheels. The cylinders were 16½ in. by 24 in., the standard size for nearly all North Staffordshire engines. There were in all about 24 of these engines, and they were to be seen wherever the company's passenger trains ran, though most of them were stationed in the Stoke area. Nos. 5 and 25 were generally to be found on the Stoke-Stafford trains, and I sometimes saw No. 25 at Birmingham (New Street). No. 48 built in 1887, appeared at one time to be employed almost entirely on the Market Drayton trains from Stoke. Of the last five engines of the class which came out, No. 1 (1891) was at Stoke, No. 2 (1891) replaced the single driver saddle-tanks on

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the Burton-Tutbury service, and Nos. 7, 10 and 71 (1894-5) took the place of the three outside cylinder tender engines (which had borne the same numbers) at Derby. Mr. Longbottom afterwards rebuilt and modified a number of these engines, Nos. 24, 35, 40, 52 and 61, by adding radial trailing wheels and larger coal bunkers, thus converting them into 2-4-2 tank engines, and enabling them to run longer distances. This alteration did not take place until 1899-1902, when Nos. 24 and 61 were put to work between Stoke and Manchester.

The above-mentioned 2-4-0 and 2-4-2 tank engines had the standard boiler designed by Mr. Longbottom. This boiler had 715 sq. ft. of tube heating surface, and 92 sq. ft. of firebox surface, the total being 807 sq. ft. The grate area was only 15½ sq. ft. and the working pressure was 140 lb. Not only the standard passenger tank engines, but also all rebuilt tender goods engines and the goods tank engines had similiar boilers, which were interchangeable.

The train services of 1890-91 cannot be said to have been better than those of 1880. The best trains between Derby and Crewe all took 1 hour 45 min. for the 51 miles journey. This record was distinctly worse than that of 1880, when not only did the 8.12 p.m. from Derby run through in 1 hour 18 min., but the 4.40 p.m. from Crewe performed the journey in 1 hour 40 min. There was one additional fast train from Derby to Ashbourne at 5.20 p.m. This conveyed a through carriage from St. Pancras to Ashbourne.

On the Stoke-Macclesfield-Manchester road there was a slight increase of speed. Of the down runs that of the 7.17 p.m. ex-Stoke (4 p.m. from Euston) was the best, the 20-mile run being covered in 26 min. But the credit of this run was due not to a North Stafford engine but to the celebrated London & North Western engine, No. 955, *Charles Dickens*, which worked this train. The best time by a North Staffordshire engine was 28 min., an average of 42·8 m.p.h., on the afternoon train, usually worked by one of the "John Bramley Moore" class. The feat of which the North Staffordshire officials were most proud was the working of the 12 noon London express from Manchester, the timing of which was as follows :—

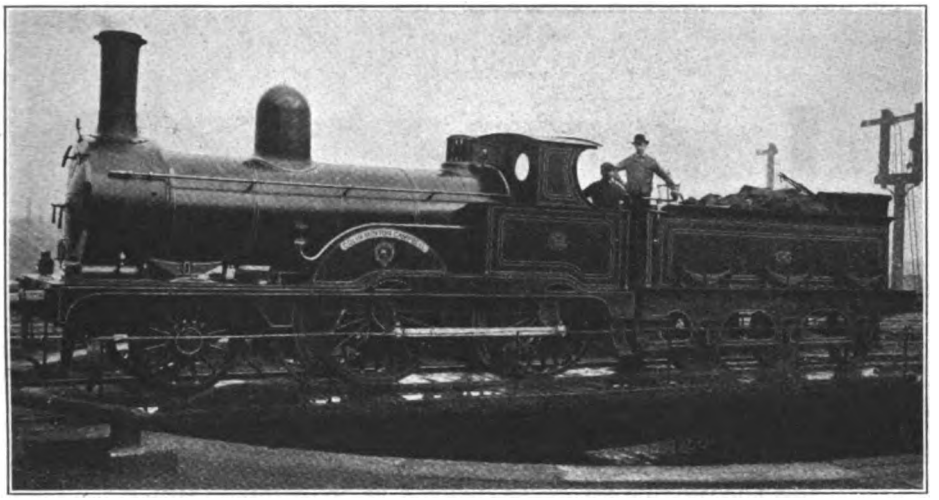

Photo.] [*Loco. Publishing Co., Ltd.*

2-4-0 LOCOMOTIVE NO. 55, "COLIN MINTON CAMPBELL."

Designed by Mr. Clare, and built at Stoke, 1882. Coupled wheels, 6 ft. diam. Cylinders, 16½ in. by 24 in.

Miles.				Speed.
	Stockport	dep	12.13	39⅓
11½	Macclesfield (Hibel Rd.)	arr.	12.31	
		dep.	12.35	40·2
19⅞	Congleton	pass	12.46	
31⅛	Stoke	arr.	1.5	

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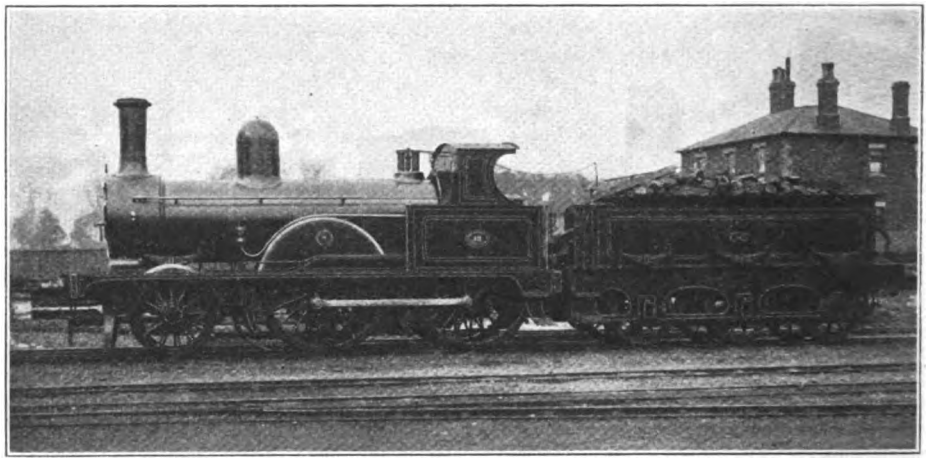
This train was a heavy one and sometimes loaded up to about 220 tons. The line from Cheadle Hulme Junction rises practically the whole way to the summit at Macclesfield Moss, after which it descends to Stoke. The start from Macclesfield is not easy, for there is a rise for 2½ miles, most of which is at 1 in 102. Consequently a pilot had often to be taken from Stockport or Macclesfield, and was put off at Congleton. This, however, must not be counted to the discredit of the North Stafford engines, for I rarely saw or travelled behind the North Western *Charles Dickens* on the 8.30 a.m. from Manchester without a pilot from Stockport to Congleton.

The North Staffordshire engine on the 12 noon from Manchester worked this train as far as Stoke, where the front or London portion was then taken in charge by a London & North Western engine. The rear portion of the train went to Birmingham at 1.17 p.m., *via* Stafford, and was worked by the same North Staffordshire engine which reached Stafford at 1.44 p.m., and came off there. The engines used were of the 6 ft. 2-4-0 class.

Prior to Mr. Longbottom's arrival in 1882, the local goods trains were usually worked by tender engines, although there were a number of old six-coupled tank engines of various sorts and sizes. The North Staffordshire is eminently a line upon which goods tank engines can be employed to great advantage, especially upon the local goods trains in the Potteries. Mr. Longbottom, therefore, built at Stoke, between 1883 and 1899, no less than 49 0-6-0 goods tank engines with 4 ft. 6 in. wheels and 16½ in. by 24 in. cylinders, the later ones having larger cylinders, 17 in. diam. These engines had the standard boilers previously mentioned, weighed but 44¾ tons in working order, and carried 950 gallons of water.

The last goods tank engines of Mr. Longbottom's design made their first appearance in 1899, and were larger than the previous class. These are 0-6-2 engines with 4 ft. 6 in. wheels and 18 in. by 24 in. cylinders, and there are about half-a-dozen of the class in service.



2-4-0 LOCOMOTIVE NO. 19, AS REBUILT BY MR. LONGBOTTOM.
Originally built at Stoke in 1871. The only locomotive with 6 ft. 6 in. coupled wheels. Cylinders, 17 in. by 24 in.

Finally, at the end of the century some of the older 2-4-0 passenger engines were completely rebuilt at Stoke, the pressure being increased to 150 lb. per square inch. Amongst these was the one 6 ft. 6 in. coupled engine No. 19, and some of the 6 ft. coupled engines such as Nos. 38 and 39. The new boilers had a total heating surface of 914 sq. ft., the tubes supplying 815 sq. ft. and the firebox 99 sq. ft. The tenders of all the engines were somewhat small, though carried on six wheels, and had a

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water capacity of 1,550 gallons only. But the through runs made by the passenger engines at this period were not of great length.

Mr. Longbottom died early in 1902, after nearly 20 years' tenure as the head of the locomotive department. After his death a new era began in the annals of the company's locomotive stock, and much larger and more powerful engines have been built since 1903 to cope with the increasing weight of the trains.

I am indebted to a friend, who has an intimate knowledge of the old North Staffordshire engines, for a correction in my account on page 319 of the cabs of the 2-4-0 engines Nos. 13 to 15. These engines were built by Dübs & Co. in 1875 with the modern form of cab, somewhat similar to that of engine No. 16 illustrated on page 317. The 6 ft. 6 in. coupled engine No. 19 had the special cab with large square side windows, which could be let down with a window strap in a similar manner to the window of a railway carriage.

The 12 noon London express from Manchester was worked long prior to 1880 by the North Staffordshire engines between Manchester and Stoke, and at one time the 16 to 25 class of single engines were employed on this train. After the 6 ft. 6 in. coupled engine No. 19 was built in 1872 it took the place of the singles on this train both before and after the Dodd's wedge motion had been replaced by the Stephenson link motion.

International Communications and Transit.

We are advised that the following recommendations have been adopted by the General Conference at Barcelona of the League of Nations in regard to International Communications and Transit. These have been transmitted to the Governments represented on the Conference for action.

1. A recommendation to facilitate the international transport of goods, especially providing for "through transport" on the basis of "a single waybill subject throughout to the same conditions."

2. The facilitation of international transport of passengers and baggage "under conditions of speed and comfort corresponding to the importance of each train service." In this connection "through-booking facilities" (as far as possible without change of carriage) are strongly recommended.

3. That all possible measures be taken to permit and facilitate the reciprocal utilization and exchange of rolling-stock on the railway systems of the States adhering to the Railway Convention.

4. This provides for the preparation of special conventions where necessary to give effect to the previous three paragraphs.

5. The adoption of all possible measures to remove any discriminatory treatment or tariffs dependent upon the nationality of passenger, or the ownership or commercial origin of goods, or the flag or ownership of vessels employed either before or after their transport by rail. This recommendation further prohibits private agreements for the granting of rebates to favoured passengers, consignors or consignees; but it recognises them where they are duly published and equally available to all. It also enjoins the publication of transport rates based upon the tariffs legally in force; but it does not prevent "the existence and establishment of different tariffs for internal, import, export or transit traffic, based on varying traffic conditions or on commercial competition between routes." It does not in any way affect the question of combined rail and sea tariffs.

6. This recommendation deals with the necessary instructions to be given to any international bureaux which may be created in this matter "to exchange directly with the League of Nations any useful information relating to the exercise of their functions, and to submit to the League an annual report."

7. Under this recommendation it is recognised that "in case of an emergency affecting the safety of a State or the vital interests of a country" it may be necessary in extreme cases and for a limited time for a State to deviate from the provisions of the above Articles; but it is understood that the "principle of the freedom" of communication and transport must be observed to the utmost possible extent.

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Locomotive Cabs.

[No. II.]

By THEODORE HORN, B.A.

IT is now time to turn our attention to a type of cab which is becoming increasingly popular, and may be generally described as the side-window cab. Now such a type was no new thing; the original Stirling design had circular side windows, and we have noticed certain elaborate early cabs likewise fitted with side windows. But these were rarities, and the type did not become standard or even frequent till the present century. It is indeed popularly supposed to have started on the North Eastern under Mr. T. W. Worsdell in 1886, but this is not so: the honour goes to the Great Eastern, a railway which after an interval has returned to the type in an improved form. It may be said in passing that these cabs are often called "American." It is true that the same type is almost universal in America, but there is little in common between the usual form of cab in that country and the smaller and neater erections of British railways.

Apart from the examples cited above, the first class of British engines to be provided with genuine side window cabs was Mr. W. Adams' "Ironclad" class of 4-4-0's, built for the Great Eastern in 1876–7. These cabs had one large window in each side, and a similar design was fitted to the same engineer's "Moguls" built for the same railway in 1879. Apropos of the remark made above as to the name "American," it is noteworthy that these "Moguls" incorporated several genuine American features in the design.* Mr. Bromley however abandoned this design of cab, and it did not reappear till the "Claud Hamiltons" came out in 1900. These had handsome and roomy cabs with two windows in the side, and the roof had a considerable extension to the rear. The same type has been perpetuated in the 4-6-0 and large 0-6-0 classes, and may be said to be the standard cab on that railway. A variation of the design is found on the rebuilt T 19 class, both 2-4-0 and 4-4-0, in which there is only one side window.

On the North Eastern the type has been standard for 34 years. It was first fitted to the "D" class of 2-4-0 express engines built by Mr. T. W. Worsdell in 1886, which incidentally were the first 2-cylinder compounds, and likewise had the continuous splashers so long a feature of all North Eastern 4-coupled locomotives. Reference has already been made to the amazing variety of cabs previously to be found on that line, and Mr. McDonnell's attempt at standardization had only had the effect of adding one more type of cab to the already heterogeneous collection. Mr. T. W. Worsdell produced an entire change in this respect, and from the construction of the old class "D" locomotives,† the large cab with two side windows has been fitted to every class of tender engine on that line. Indeed, apart from necessary increases of size, the type has only been modified twice. The "Q" and "Q 1" classes of 1896–7 have clerestory roofs, and the first batch of 4-6-0's (class S) of 1900 originally had cabs with only one side window. Even these latter have been altered to the standard design. The reason for fitting the smaller cab on this class was to make the engine short enough to be turned on a 50-foot turntable.

The North British again has both varieties of side window cab. The "Atlantics" of 1906 were first given a cab with two side windows, but the standard is now one with only one window, this being provided in the 4-4-0 and 0-6-0 classes built since that date by Mr. Reid, as well as on the 4-4-0 and 2-4-0 rebuilds. The two 0-4-0 tender locomotives of that line however have received cabs identical in general outline but with no side window, presumably owing to limitations upon the length permitted in this case.

Two other Scottish railways have

* See RAILWAY MAGAZINE, September, 1918.

† The old class "D" are now rebuilt as 4-4-0 and incorporated in class "F," the present class "D" being 4-4-4 tanks.

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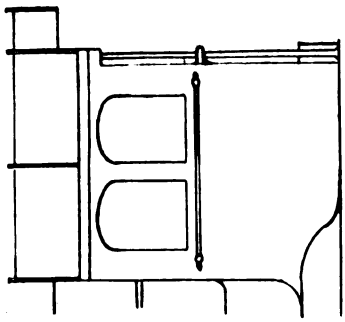
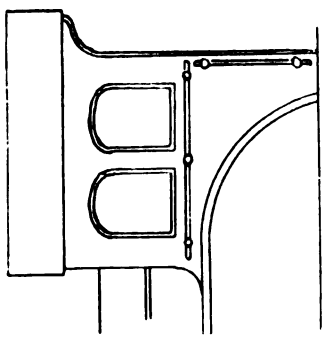
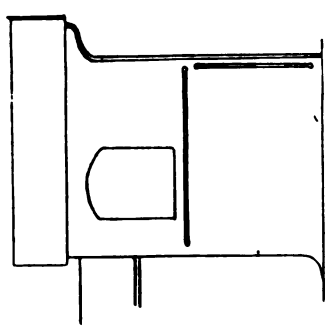


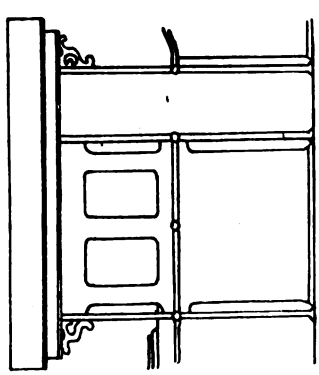
Great Central Railway.



North Eastern Railway.



North British Railway.



O.W. & W. Rly., 1859.

SIDE WINDOW CABS.

adopted the side window cab, though not as a standard design. The Great North of Scotland has several of its numerous 4-4-0 passenger engines fitted with a cab very similar to that of the North Eastern "Q" class, with two side windows and a clerestory roof, and the Caledonian has 11 locomotives, all of the 4-6-0 type with 5ft. 9in. wheels, which have received a cab with two side windows, No. 917 of this class, and Mr. McIntosh's last batch of mixed traffic engines, Nos. 179–188. A cab similar again to the North Eastern design was for a short time fitted to No. 4105 *Earl Cawdor* on the Great Western, but has now been removed. Finally, the Great Central has now introduced the type on the latest series of "Directors," and on the War Memorial engine, No. 1165 *Valour*. These cabs have two side windows, but the shaping of the roof is distinctly novel.

So far as tender locomotives are concerned one feature remains to be considered, that of tender cabs. While such are a common feature on many foreign and Colonial railways, they are very rare in this country, only one railway—the Midland—having made any attempt to provide them in large numbers. In the case of an express locomotive which rarely runs tender first, there is not so much need for shelter on the tender. Indeed, the small erections of tarpaulin on an iron framework fitted by the Midland to many 4-4-0 and 4-2-2 engines in 1916 and onwards seem to have been intended largely to screen the glare from the firebox in the event of air raids, and these have apparently since been mostly removed. But with a goods locomotive the case is different, especially if the engine has to do a large amount of shunting or run for considerable distances tender first. Thus the large 2-8-0 locomotives built at Derby for the Somerset and Dorset Joint Railway have very neat tender cabs for the reason that, when built at any rate, there was no turntable on that line large enough to accommodate them. For the other point, one may frequently see during inclemen weather a piece of sacking or tarpaulin rigged up from the cab roof to the tender front. The Midland alone has adopted the principle of tender cabs, and has since 1908 fitted a large proportion of its numerous 0-6-0 goods engines with a large shelter, which is, it must be con-

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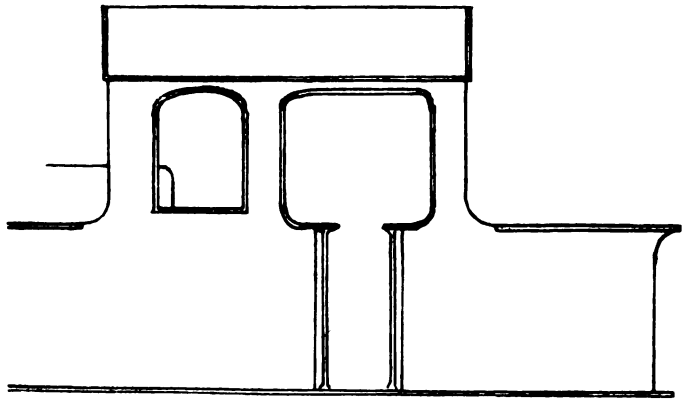
fessed, exceedingly ugly. Some of the larger engines however have neater fixtures, and the new "banker" No. 2290 has a very neat tender cab, similar to those of the Somerset and Dorset locomotives above mentioned. But other railways have not yet adopted the practice. The London and North Western fitted one to an eight-coupled engine some time ago, and the Great North of Scotland has one 4-4-0 so equipped for working one of its smaller branch lines. But the day of the tender cab has not yet come in this country.

There is one uncommon feature which deserves mention. Two railways have each on one class of locomotive provided a cab with a door in the front, opening on to the running board. The engines in question are the well-known 4-4-2 express class designed by Mr. (now Sir John) Aspinall for the Lancashire and Yorkshire in 1899, and the now defunct 4-2-2 singles of Mr. Bromley's design on the Great Eastern. Such a door however is not in the nature of things a usual fitting, as it demands the presence of a small trailing wheel, together with a fairly narrow firebox and boiler.

To deal adequately with tank locomotive cabs is an even more complicated task, for while in this case there are probably fewer distinctive designs, minor variations are infinitely more numerous. The *raison d'être* of the tank locomotive, a handy engine which will run either way with equal facility, or work entirely in station yards, seems in the nature of things to demand an all-over cab with spectacle plate at back and front. And so a very early step was to fit two weather-boards, as was typical of the Cudworth tanks on the South Eastern. The next development was equally naturally the bending over of each weatherboard at the top, so that the two formed one continuous roof. Early examples of this are the old Great Northern "single" and well tanks, which were so fitted even in Mr. Sturrock's time.

But as might be expected, the logic of the case was not always followed up, and to this day many of our railways have tank engines with cabs only at the front end. Thus the numerous 2-4-0 and 0-4-2 side tanks on the Great Western, (except those which have been fitted for auto-train working), and most of the 0-6-0 saddle tanks of the same railway have still small cabs similar in design to those of its tender engines, which are open at the back. The same is the case with the older 0-6-0 saddle tanks of the Great Northern, while many of the London and North Western 0-6-0 saddle tanks used for shunting still retain the more primitive equipment of plain weather-boards.



GREAT EASTERN RAILWAY 2-4-2 T. (1300 Class.)

In general, just as in the case of tender engines the cab is to a certain extent altered in shape according to the absence or presence of splashers, so in the case of tank engines, the type and design of tank largely conditions the cab to be fitted. Thus in a saddle or well tank the cab may be very similar to that of a tender engine, whereas, if side tanks are present, the cab may be placed in rear of them, as for example on the Caledonian 0-4-4 and 0-8-0

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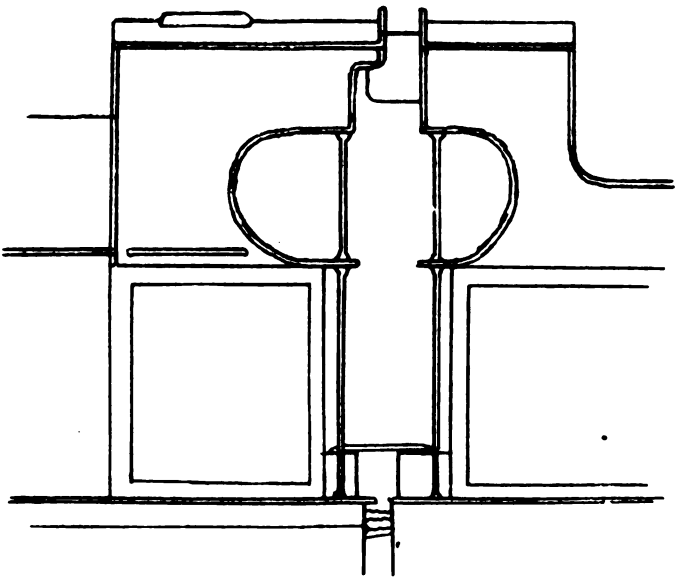
types; or it may be placed on top of the rear end of the tanks, as on the Midland 0-4-4 and 0-6-0 classes; or, finally, the tank and cab side sheets may be to all appearance continuous, as on all North Eastern tank engines built since 1886. But as it is often possible to find examples of two or more of these different types on the same railway, it is clearly more difficult to trace a continuous development other than in respect of size.

There are, however, certain designs worth noting, in which the tank engine cab bears a distinct resemblance to that of the tender engine. Thus the Stroudley and Drummond tanks in nearly every case are very similar in general outline to those we have examined above in the case of tender engines. Any railway where that tradition is represented will furnish examples. So, too, the Stirling cab has been adapted to the conditions of tank engines. Still more noticeable instances are the "square" cabs with which Mr. Jones equipped his tank rebuilds on the Highland; and the North Western type, which cab shows probably the longest continuous existence of any type, being only very slightly altered in the latest classes, the 4-6-2 and 0-8-2 types.

Finally, there is again the side window cab adapted for tank locomotive purposes. Indeed, the earliest instances of side window cabs mentioned above were to be found on well tanks. Since then there have been several isolated examples. Thus in 1873-4 the Caledonian built a class of 0-4-4 tanks with cabs having a large square window in the side. The Cambrian Railway has several examples of cabs with both round and square windows.

The large 4-6-4 locomotives built for the London, Tilbury and Southend Line, and now to be found on the Midland, have side windows. But only one British railway has adopted the type as standard—the Great Eastern. Here this pattern first appeared on the small 2-4-2 tanks of the 1300 class, in 1909 and has since been used on the larger 2-4-2 and 0-6-2 classes, in each case the lofty cab with one large side window being as commodious as it is neat. Mention should, perhaps, also be made of the numerous Fairlie locomotives which have been used at one time or another on standard and narrow gauge lines in this country, some of which have also been equipped with side window cabs.



TENDER CAB, S. & D.J. RAILWAY (2-8-0 Class.)

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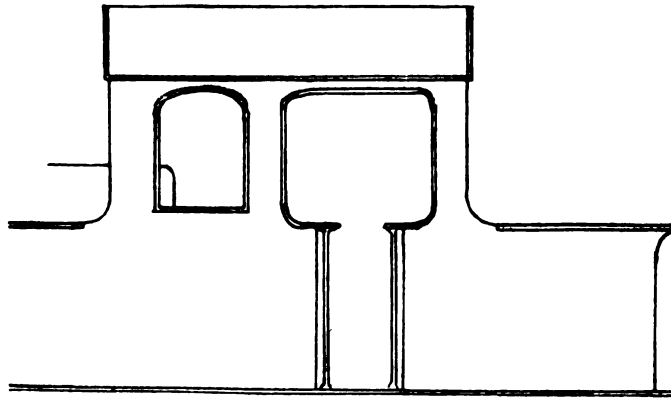

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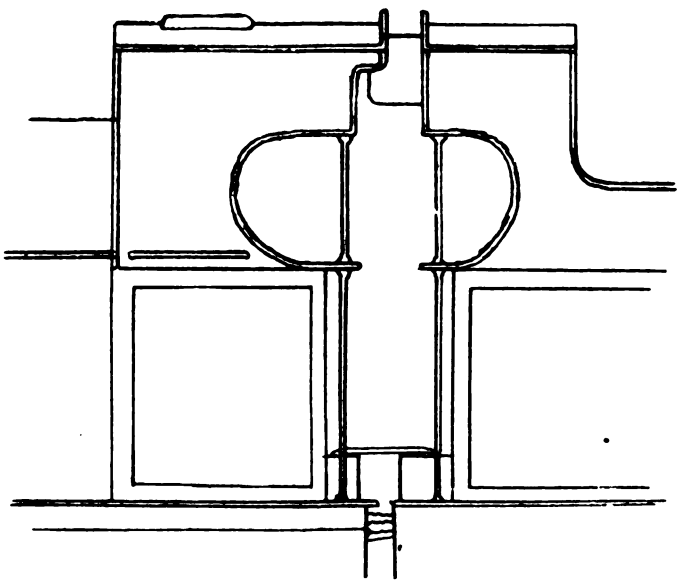

TENDER CAB, S. & D.J. RAILWAY (2-8-0 Class.)

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Traffic Improvements on the North Staffordshire Railway.

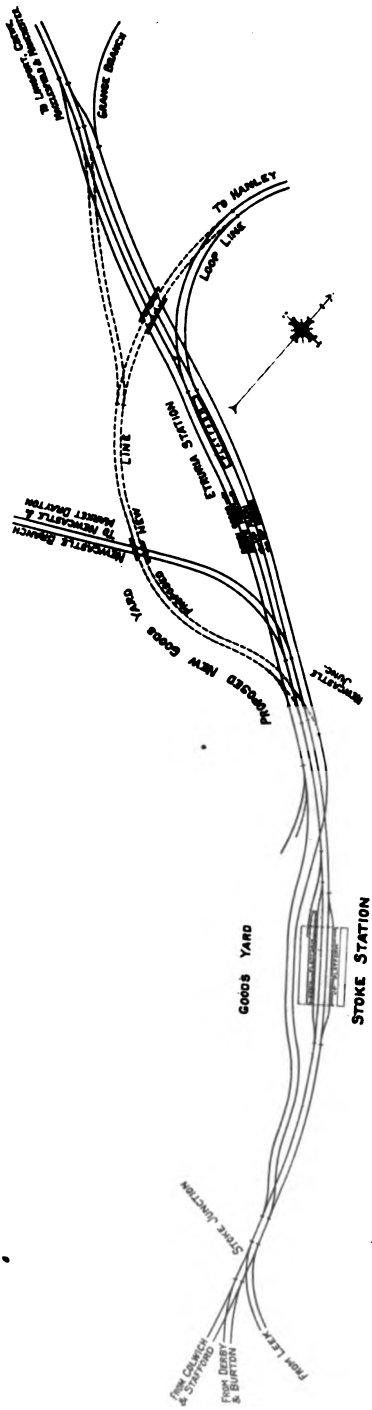

FIG. 1.—TRACK FACILITIES IN THE STOKE AREA, SHOWING PROPOSED NEW GOODS LINE.

TRAFFIC on the North Staffordshire Railway is severely handicapped by the fact that the present line between Etruria and Stoke Junction constitutes a bottle-neck two miles long, and through this a tremendous amount of converging traffic has to pass. It is therefore essential that a new line should be built, as, until this is done, no improvement can be made in the passenger and goods facilities in the Stoke area. Hence the Bill which the company has placed before Parliament.

By the courtesy of Mr. F. A. L. Barnwell we are now enabled to reproduce two diagrams showing the existing running lines in the area between Etruria and Stoke Junction, and indicating how the proposed new goods line will effect a better distribution of traffic both north of Etruria and on the down side of the line.

Fig. 1 shows the running lines as existing in the congested area between Etruria and Stoke Junction, and in dotted lines the proposed new goods line as laid out in the deposited plan before Parliament. At present passenger traffic between the above points has to work over two running roads only. All the traffic from the North, viz., from Manchester through Macclesfield, and from Crewe *via* Harecastle, the local services from the loop line and the traffic of the Market Drayton branch and from Newcastle, has to pass through this congested area, likewise the north-bound traffic from London and Birmingham coming *via* Colwich and Stafford, also the Derby traffic and the local services from the Derby line, with the service of trains from Leek and the Biddulph Valley line.

Stoke Station now consists of two platforms only for through traffic, and there is one bay platform road on the down side, from which trains work local services mostly in the direction of Newcastle and Market Drayton. There are up and down goods lines, which commence just north of Grange Junction and these lie outside the passenger lines and lead to the goods yard, which is on the west side of Stoke Station. The goods lines

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join the main line just north of Stoke Junction.

Fig. 2 shows how the proposed new goods line will allow the goods traffic to be separated entirely from the passenger traffic north of Etruria and at the same time transfer the goods traffic to the down side. It will also give access to waste land on the south side of the Newcastle branch, which it is proposed to develop into up and down marshalling yards, so that the existing goods yard in which the marshalling is now done can be dispensed with and the space which it now covers rendered available for widening Stoke Station as shown. Unless the goods yard as existing is dispensed with, there is no possible means of widening Stoke Station, as the goods yard could not be transferred further to the west owing to the existence of the Trent and Mersey Canal, which lies immediately on its west side. Moreover, any attempted widening of the station on the east would entail interference with the station road—an impracticable proposition.

If the full development shown in Fig. 2 is ultimately carried out, the traffic from Manchester through Macclesfield, comprising the express services to Euston, would at the junction north of Grange Junction take the up fast road and the traffic from Crewe to Derby *via* Harecastle would be diverted at this junction to the up slow line. The slow local services from the loop line would also be kept entirely separate from the fast Manchester to London traffic, as this local service would be confined to the slow lines, and work mostly on to the Derby and Leek lines. In the same way the down fast traffic from London to Manchester would be able to run into Stoke Station without interfering in any way with the Derby to Crewe services and the local services from the Derby line and Leek line. Provision would also be made for working local services from the bay in a northerly direction, and also from the bay from the south end of the up slow platform in a southern direction.

This scheme, if fully developed on the lines suggested, will entirely do away with the existing congested condition of Stoke Station, which at present is the determining factor limiting the train services of the district. It will also enable great economies to be made in traffic working, especially on the goods side, and permit of the future effective development of the congested Potteries area.

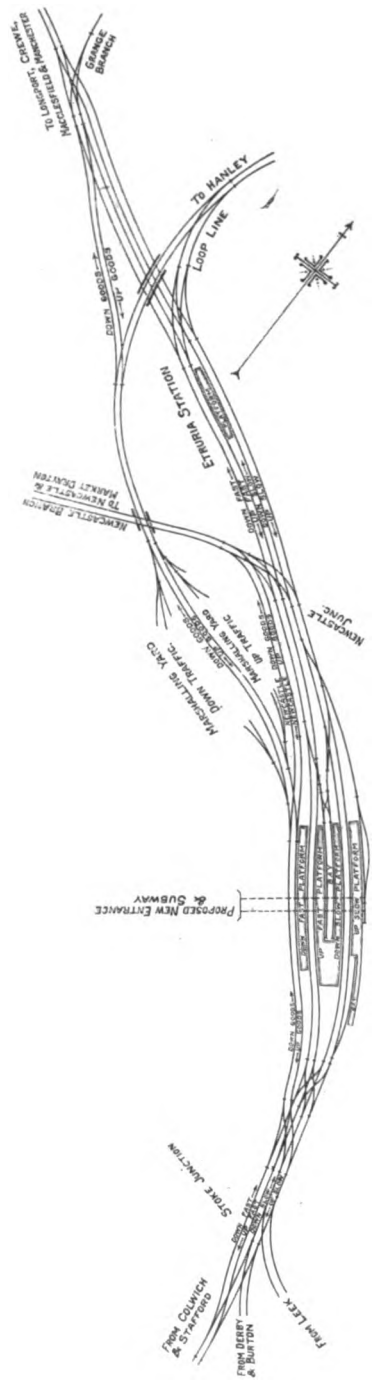

FIG. 2.—TRACK FACILITIES IN THE STOKE AREA AS THEY WILL BE ON COMPLETION OF PROPOSED GOODS LINE, SHOWING RE-DISTRIBUTION OF TRAFFIC WORKING ARRANGEMENTS.

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Catch-Points and Buffer Stops.

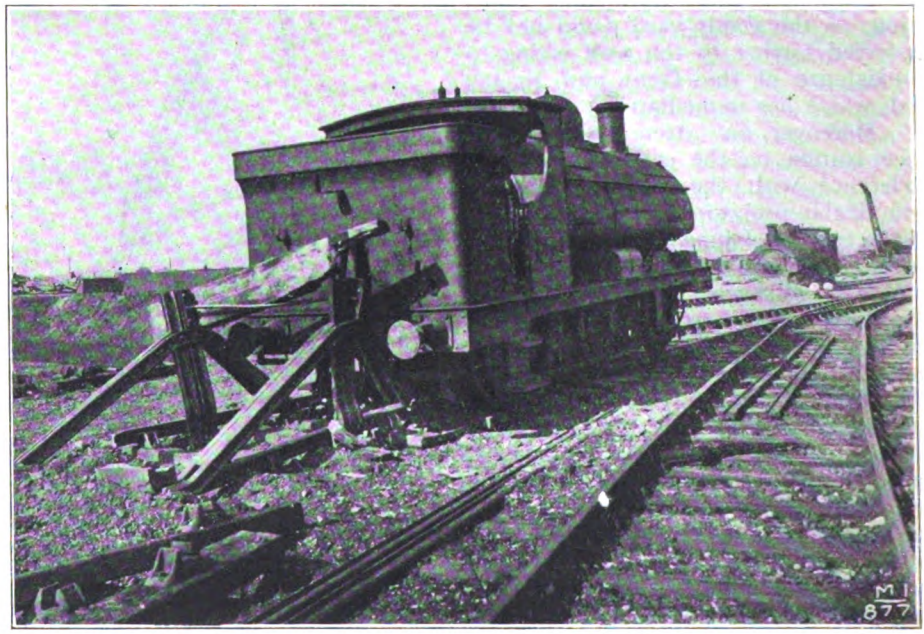
CONCLUSIONS RESULTING FROM A NOTABLE SERIES OF TRIALS RECENTLY CONDUCTED ON THE GREAT WESTERN RAILWAY.

WITH characteristic enterprise the Great Western Railway recently conducted a series of experiments to determine the relative advantages of various types of catch-points and buffer stops.

Information as to the results of these experiments has been placed at our disposal by the courtesy of Mr. Chas. Aldington, C.B.E., General Manager, Major F. G. Wright, Assistant Chief Mechanical Engineer, and other officers of the Great Western Railway, together with an interesting series of photographs, some of which are reproduced.

In one, No. 1629 (0-6-0 tank-top engine with coupling rods removed) was derailed through a standard single catch-point without any deflecting rail, but the engine kept parallel to the road it was leaving. The formation of the ground was ashes, which had been newly tipped and thus rendered the ground rather soft. This let the engine down at the leading end.

The second test was made with engine No. 977 (2-4-0), which was derailed through a single catch-point with a turnout, or deflecting rail, of 50 ft. radius. By reference to the illustration it will be seen that if the flange of the trailing wheel had mounted the rail, the trailing end would have swung round and fouled the road which the catch-point was intended to protect. A point to be observed in connection with this experiment is that, although the leading end of the engine was deflected from the road which the catch-point was protecting, all the wheels



RUNNING ENGINE INTO STANDARD BUFFER STOPS.
Locomotive run into drag of soft ashes without rails in background.

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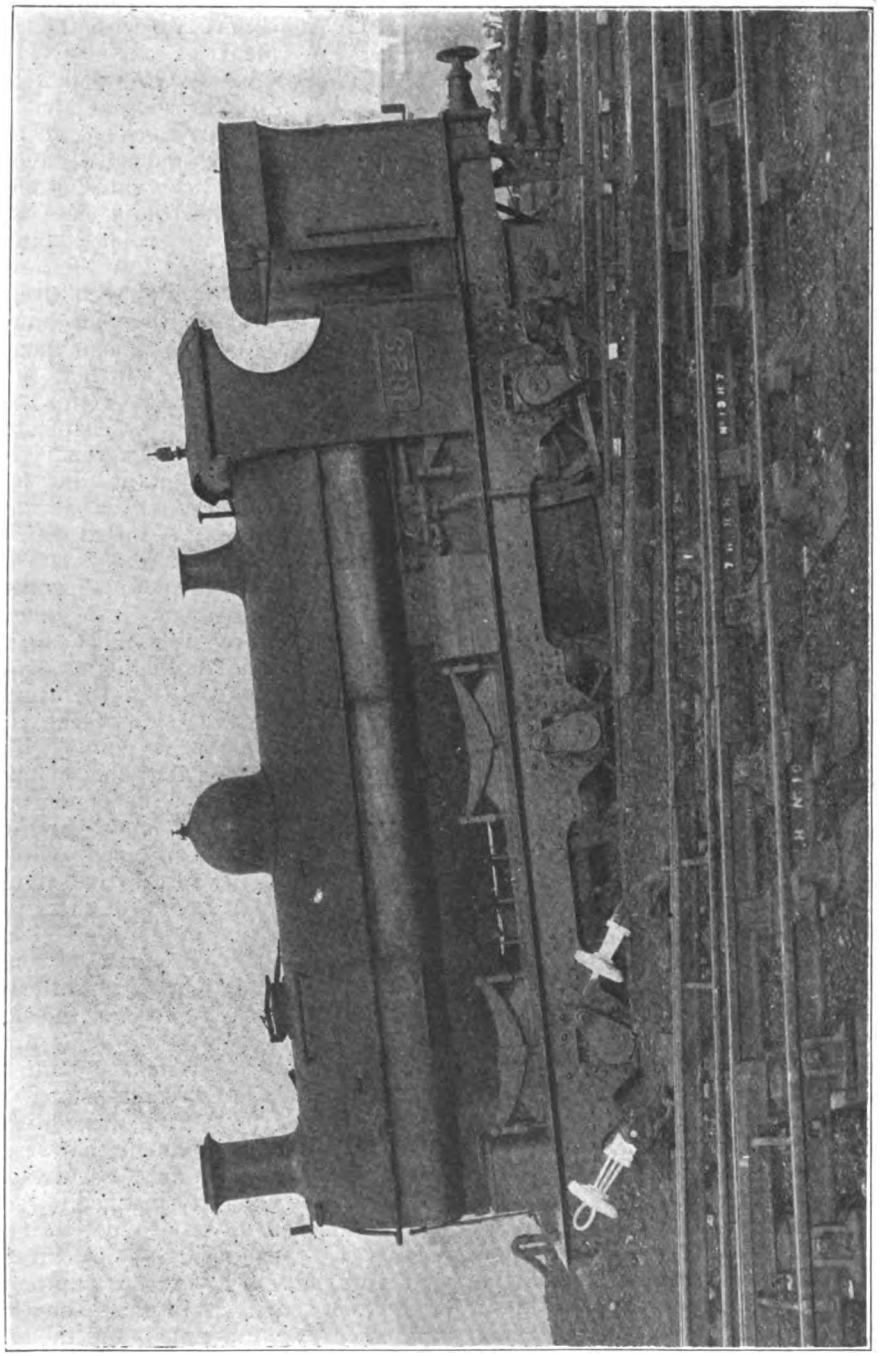

DERAILMENT OF ENGINE NO. 1629 ON SINGLE CATCH-POINT.

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DERAILMENT OF ENGINE NO. 977 ON SINGLE CATCH-POINT WITH TURN-OUT.

eventually jumped the deflecting rail and the resultant conclusion is that such rails are of little value.

The third derailment was made at straddle catch-points when the leading and trailing wheels of engine No. 1272 (another 0-6-0 saddle-tank) jumped the point with the result that the engine took the same course as if the road were fitted with a single catch-point. The difficulty in this case is to determine which side of the straddle point the engine will jump, and it must generally be held to be a most objectionable form of catch-point on account of the liability of damage to the stock and, also, the probability of it causing a broken axle. Generally speaking it cannot be said that the result of the experiments justified the use of straddle catch-points, and it must be concluded that the additional expense of their installation is not warranted. A double catch-point and short length of parallel road were used in connection with the derailment of engine No. 1804 (also a 0-6-0 saddle-tank). Results showed that with this arrangement the stock is not damaged, and the engine can satisfactorily be derailed quite clear of the road the point is intended to protect. In the case of a middle road with the main line on either side, however, this class of point should be set back further in the siding so as to provide a space for the engine to derail with an ordinary single catch-point at the fouling distance in order to comply with the Board of Trade regulations.

Trials were subsequently carried out with an empty 10-ton wagon. The first trial was through the straddle points. Both the wheels on the left side of the vehicle jumped the points, with the result that the conditions were just the same as if an ordinary single catch-point had been used, with the disadvantage that it is impossible to say which side of the straddle points the vehicles will jump. To confirm this, the left hand tongue was closed, converting it into a single catchpoint, but the result of the derailment was precisely the same.

In order to confirm the facts arrived at from the previous tests, the points were restored to straddle-catch-points. The result of the first trial was, however, repeated and the statement that straddle catch-points are an unnecessary waste of money was abundantly justified.

In a subsequent test to determine the utility of a single catch-point, an 8-ton goods wagon was allowed to approach at a speed of, roughly, 5 m.p.h. The leading wheels only were derailed, and the wagon stopped with the front axle 12 ft. 6 in. from the toe of the switch and with the leading wheels about 1 ft. outside the rails to the right.

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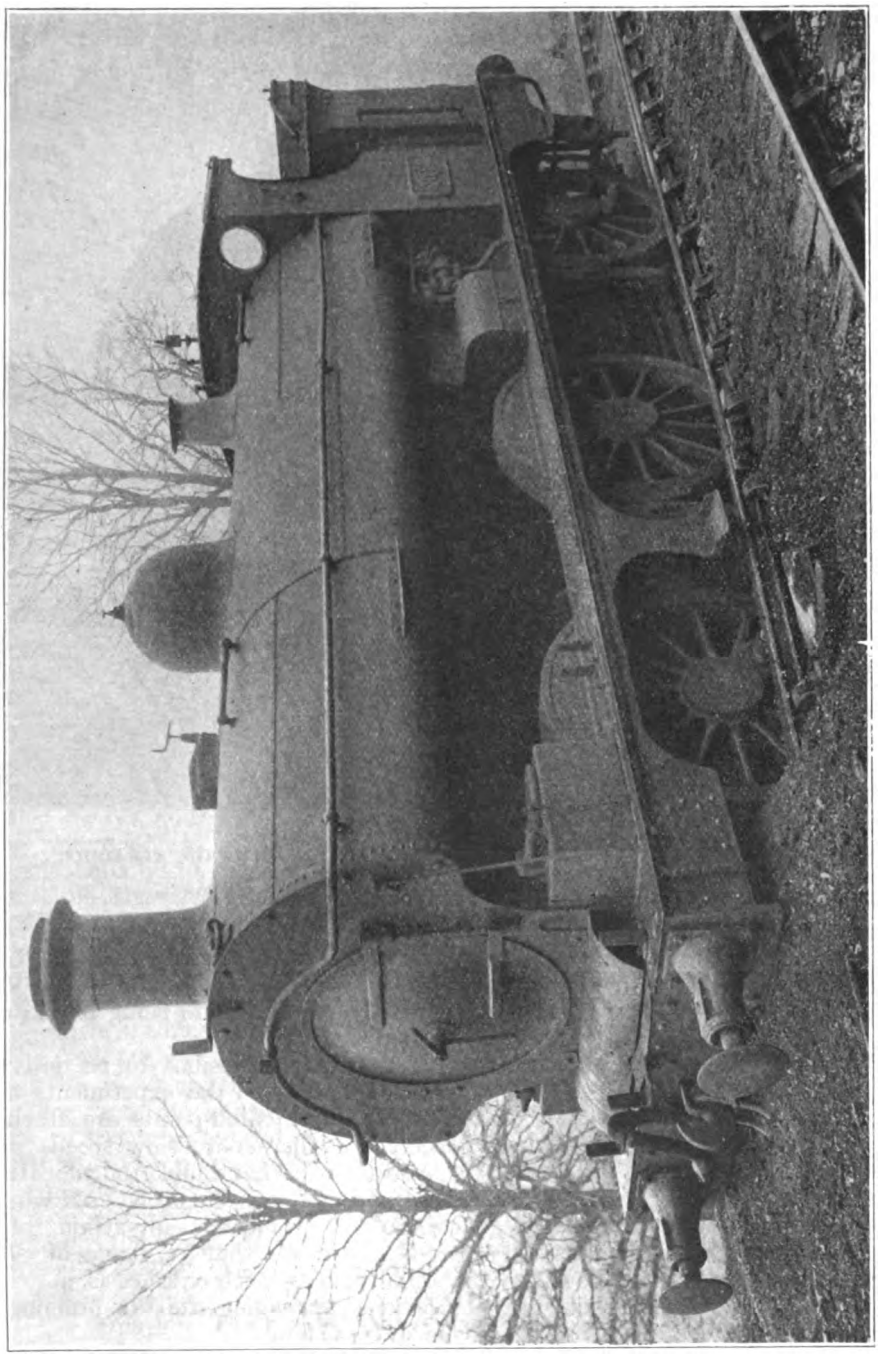

DERAILMENT OF ENGINE NO. 1604 ON DOUBLE CATCH-POINTS.

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A further test was also made in order to determine the power of straddle catch-points to keep a derailed vehicle in a straight line. An 8-ton open goods wagon approached at 5 m.p.h. and, on reaching the points, the leading wheels only were derailed. The wagon stopped with the front axle 14 ft. from the toe of the switch and the leading wheels about 6 in. to the right of the running rails. The wagon was damaged, the body being twisted and the axle guards bent. This appeared definitely to prove the fact, established by previous tests, that the straddle catch-points were quite unsuitable to the requirements.

DERAILMENT OF ENGINE NO. 1272 ON STRADDLE CATCH-POINTS.

Some interesting experiments were also carried out for the purpose of ascertaining the utility of the buffer stops at the end of refuge sidings, &c., and two tests are described below.

With the view of testing the efficacy of the standard type of buffer stops when an engine comes against them at a speed which is not excessive, a stop block consisting of the usual iron frame and wooden beam was provided at the end of a level stretch of line. A six-wheel tank engine (dead) approached at 12·5 m.p.h., and on striking the beam the first two pairs of wheels were derailed and the engine was thrown a distance of 1 ft. 3 in. to the left. The right-hand upright and front stay of the buffer stop was completely broken through on the left-hand side, and the left-hand upright damaged. The buffer beam of the engine was slightly bent at the buffers, this being most noticeable on the left-hand side.

In the second case, a drag about 12 yards long, consisting of a bed of soft ashes (without rails) was prepared. A six-wheel tank engine (dead) approached at 13·6 m.p.h. and entered the bed, but stopped as soon as the trailing wheels left the rails, the leading end being buried up to the footplate.

The general conclusions to be derived from the results of the experiments are that: (*a*) single catch-points are all that is necessary where only slow speeds can be attained; (*b*) that double-tongue catch-points and crossings should be used where engines and vehicles can attain high speeds; and (*c*) that a bank of soft material such as earth or ashes is quite as efficacious as a buffer stop for bringing a vehicle to a stand.

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Line Operation and Terminal Capacity.

The Successful Adoption of Improved Methods of Line Working is largely governed by the factor of Terminal Capacity. The two questions should be considered together if best results are to be obtained.

By CHARLES TRAVIS, M.Inst.T.

(Joint author of "Practical Railway Working.")

THE strictest economy in railway working was never more essential than at the present time. The increase of railway wages to a relatively high level and the general concession of an eight-hour day, which has further contributed to many already serious operating problems, have raised the outgoings for labour remuneration to such a point that the cutting out of all forms of unremunerative working has become of first importance.

In a recent lecture it was suggested that such terms as "delay" and "congestion" should be deleted from the railwayman's vocabulary, and it really does seem that in these days when traffic detentions represent such a high, and in many cases, avoidable expenditure, all possible measures should be taken to minimise delays and reduce congestion. "Keep moving" is a traffic maxim applicable equally to railway and other transport industries. The secret of effective transportation is to move persons and things as quickly and economically as possible, and delays brought about either by bad working or defective organisation—which is almost the same thing—are to be deplored.

Owing to the depressing effect of the coal strike, and the consequent serious set-back to the trade of the country, no difficulty is at present being experienced in the conduct of railway freight traffic, but as soon as things take a turn for the better and traffic re-commences to flow in its old free fashion, the grave question of economical working will have to be faced. To emphasise the necessity for the curtailment of delays to the minimum I need merely remark that, whereas the pre-war engine-hour was taken at 5s., it is now calculated at 20s.—a huge percentage increase in expenditure that is not, of course, covered by any corresponding augmentation in the revenue.

Improvements to facilities have been held up.

During the war period, British railways have naturally been unable to perform the usual amount of work in connection with the improvement of facilities, and while the future outlook is a little brighter, it is to be noted that, as contrasted with the average amount of twenty millions new capital expended per annum in pre-war days, no more than four and a-half millions was spent in 1920—and one-third of that was for new steamers! Uncertainty as to the future of the railways has, indeed, been a real obstacle to the development of essential facilities, for the position has been such that it was impossible on reasonable terms to obtain the funds necessary to cover the cost of extensions and improvements.

The economic ideal of railway operation is to secure the most effective utilisation of the plant and equipment provided—in other words, to conduct satisfactorily, by means of scientific methods, the business offering with the existing rails, terminals and rolling-stock. Practically, however, it is found that traffic grows, and that, assuming the most effective method of working to be in force to meet the smaller volume, additional facilities, either in the way of line improvements or innovations in traffic working methods, are demanded to keep pace with the traffic. But the provision of additional track facilities is not altogether a useful palliative.

Like most patchwork improvements, small additions to track accommodation frequently flatter but to deceive. It may be possible by the provision of additional loops and refuge sidings to relieve the main lines to some extent, and thus to

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assist the through trains to get a clear course, but it often means that the lower class freight trains are kept standing in these refuge sidings and loops far more than is necessary or desirable. In districts of high train density, where delays have a detrimental and cumulative effect on the working of other trains, it is often a question as to whether it is not better instead of "patching" in many places to construct an avoiding line in order to turn freight trains off the main route and thus keep all traffic moving. An instance of this is to be noted in connection with the present proposals of the North Staffordshire Railway Company to build a line between Etruria and Stoke, referred to elsewhere in this issue. The present line is a bottle-neck communication two miles long, through which a tremendous amount of converging traffic has to pass, and it was decided, after investigation, that no improvement could be made in the passenger and goods facilities in the Stoke area until the new line was constructed. The re-arrangement of the lines will enable traffic to be segregated on a much better basis, and entirely do away with the existing congested condition of Stoke Station, which at present, is the determining factor limiting the train services of the district. In this actual instance one sees the important effect that terminal capacity has on line operation.

Traffic Working now being considered on More Scientific Basis.

Of recent years the various railway companies have considered the question of traffic working from a more scientific standpoint, and in certain cases have now so co-ordinated their arrangements that the fullest possible advantage is taken of the capacity of the tracks, and the most effective workings arranged. Punctual working, which means no delays, is of prime importance to the railway companies, and among the many excellent schemes in operation with this object in view, the centralised train control systems of the Midland and Lancashire & Yorkshire Railways are admirable examples. They show the manner in which the railway administrations are seeking to eradicate the possibility of traffic being delayed, owing to the inability of those concerned in the working to utilise the available capacity to the full. It may therefore generally be said that line working is in process of organisation on highly scientific lines, and in a subsequent article, I propose to develop this subject in the course of an illustrated review.

It should, however, be emphasised that line working is in the last degree dependent upon terminal capacity and in this sense "terminal" means any station, yard, siding, group, exchange point or port at which the traffic reaches its destination, or is passed from one line to another. Take the ordinary case of a large goods station being congested, and what is the result? A restriction is applied, but this rarely operates in sufficient time to stop a large quantity of traffic being on the way to the point affected. Thus, it becomes necessary for running lines or sidings, which should be kept free for line working purposes, to be utilised for the purpose of stabling any excess traffic until it is required, and it may happen as a direct consequence that a certain amount of the delay is thrown back many miles, and possibly, through junctions to foreign companies. The close relationship which exists between effective traffic movement and terminal capacity is not perhaps sufficiently recognised, and in many recent suggestions for improved line working, the question of disposing of traffic after its arrival at destination appears to have been overlooked. This, however, is to ignore the essential requirements. To quote the old saying: "it is no use trying to put a quart into a pint pot"; but if due care be exercised that the "pot" is emptied frequently, it is possible to utilise it for the accommodation of many "quarts." The analogy is a poor one, but it illustrates the position with regard to terminal working.

The Important Factor of Terminal Capacity.

The extreme importance of developing terminal facilities in due correspondence to the improvements in line working may be illustrated by a reference to the recent re-organisation of the Great Eastern Railway suburban train services. To meet public requirements, it was found that more trains were necessary, and the problem arose as to how these extra trains could be run on an already over-burdened line into Liverpool Street—equally congested as a terminus. The conditions

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were studied most minutely, and it was eventually found after meticulous consideration of details that by alterations in the signalling arrangements, the adoption of accelerated train timings, and a number of other small improvements, the line could accommodate the additional trains. But the limiting factor was the capacity of the terminals, and this question had to receive special attention. There is no necessity to elaborate all the detailed improvements that were made, but it may be said that by re-organising the engine working, and by allocating to each platform a separate engine dock, together with special facilities for water, &c., and the re-arrangement of the station barriers, the capacity was extended to cope with the requirements.

Similarly with regard to goods traffic. It is no use at all working traffic more speedily over the line if the trains, on approaching their destination—or any intermediate yard—are to be "refuged" owing to the shortage of accommodation. This statement is, of course, subject to qualification under certain conditions where the line is so intensely occupied at certain times that heavy freight trains can only be worked through conveniently at certain periods of the day; but, in general, it expresses the need for reasonable capacity at the terminating point. It is much better practice so to regulate the flow of traffic that the terminal goods stations, while being kept working at full pressure, are not blocked with traffic that cannot be cleared, for the method sometimes adopted of piling additional traffic on to an already congested point is thoroughly bad. In this connection I would quote an instance where a large goods terminal became congested owing entirely to the inability of the Superintendent to perceive the necessity for synchronizing *clearance* facilities in the way of *cartage* with the terminal capacity in the way of *unloading*. Improved arrangements had been adopted to enable the speed of unloading traffic to be accelerated, but as the cartage facilities were not suitably extended, the result was that the stages soon became badly congested with traffic, for which clearance facilities were not available. Of itself, this would not have been a serious matter, but as in this particular case the bad practice of tumbling out traffic anyhow was followed, the result was a state of absolute chaos, which eventually led to an entire stoppage of inwards traffic for a few days.

Improved Traffic Working economises Rolling-stock.

Apart from the general inconvenience caused by this method of working, unreasonable demands are thereby placed on the rolling-stock, for the holding up of wagons under load has not, except in exceptional circumstances, any economic justification. In the trade boom following the war, traffic movements developed considerably, and there arose an apparent shortage of rolling-stock. The "remedy" was discovered by the lay press to be the building of more wagons, but as a matter of fact this was no remedy at all, and merely a case of confusing cause and effect. The real problem was the more rapid clearance of wagons which were standing under load, and those who travelled about the country at that time and had opportunities of investigation, were able to see that the real difficulty was the "blocking back" of traffic at large receiving points owing to congestion, this necessarily creating an artificial scarcity of available stock. On the contrary, now that there is a decline in trade and the terminals are not working at full pressure, there is plenty of stock available to meet all traffic requirements. In fact, all over the country scores of empty wagons are to be seen stored in the most convenient position until they are required for service again.

Regulation the Crux of the Question.

The effective working of railway traffic, by which is meant the speediest possible means of transferring goods from consignor to consignee, lies in the further development of schemes for regulating movement. Much can be done by judicious arrangements between the traders and the railway companies, and, where the railway companies will give reasonable guarantees as to transit, there seems no reason why traders should continue the old-fashioned practice of ordering traffic forward in advance of requirements. By means of the systems of traffic control and regulation now being more generally extended,, arrangements to restrict or retard the flow of traffic can be effected so speedily

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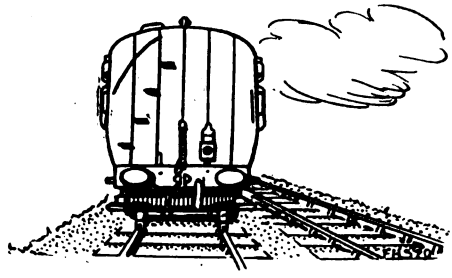
that there need not be any delay in giving effect to the requirements. While in the past terminal capacity has not been considered sufficiently in relation to traffic movement, of recent years the growing necessity of ensuring the utmost economy in railway transport has impelled a more intense investigation of the subject. Some railways have now determined what may be called the *workable capacity* of their track and terminals and have arranged as far as practicable to provide necessary facilities in correspondence therewith. In this connection, emphasis must be laid on the importance of adequate cartage strength at the terminals, for it is useless having abundant unloading facilities if the arrangements for disposing of the traffic are not in due proportion. Any general investigation designed to improve traffic working methods must include close attention to the terminals as at present there is in many cases far too much waste of time at those places.

In my article entitled "The One Remedy for Railway Congestion," which was published in the May, 1920, issue of the RAILWAY MAGAZINE, I explained that the governing factor in all traffic working was the clearance of traffic at terminal points. Free traffic movement is absolutely governed by the capacity of tracks, and terminals, and track capacity in its turn is governed by the ability of terminals promptly to handle and dispose of traffic. It was merely by a coincidence that, as I was writing this article, I noticed in the American *Railway Age* an editorial article entitled "A Good Time to Study Terminal Operation." This article postulated that no feature of the railway plant constituted a greater tax on the capacity and on the net revenues of the roads than the terminals, and it urged that in the present recession of traffic the far-sighted railway officer should engage himself in studying ways of improving terminal methods of operation, so that he could handle increased business with the maximum economy when it comes to him. The article arose out of a letter addressed to the editor by Colonel E. H. Shaughnessy, calling attention to the paramount importance of improvement in the terminal handling of traffic, and it may generally be said that the points made, both in the letter and the article, are in accord with those contained herein. All unremunerative work must be cut out. This means that improved methods of working the traffic over the line must be adopted, and if the results from these improvements are to be satisfactory, it follows that the terminal arrangements must be co-ordinated to meet the requirements.

It would be possible to continue by describing means of improving terminal capacity, both in regard to the employment of additional labour-aiding devices, and improved methods of cartage, but that is hardly the issue at present in question. The only point for immediate consideration is to emphasise the very close relationship that exists between line operation and terminal capacity.



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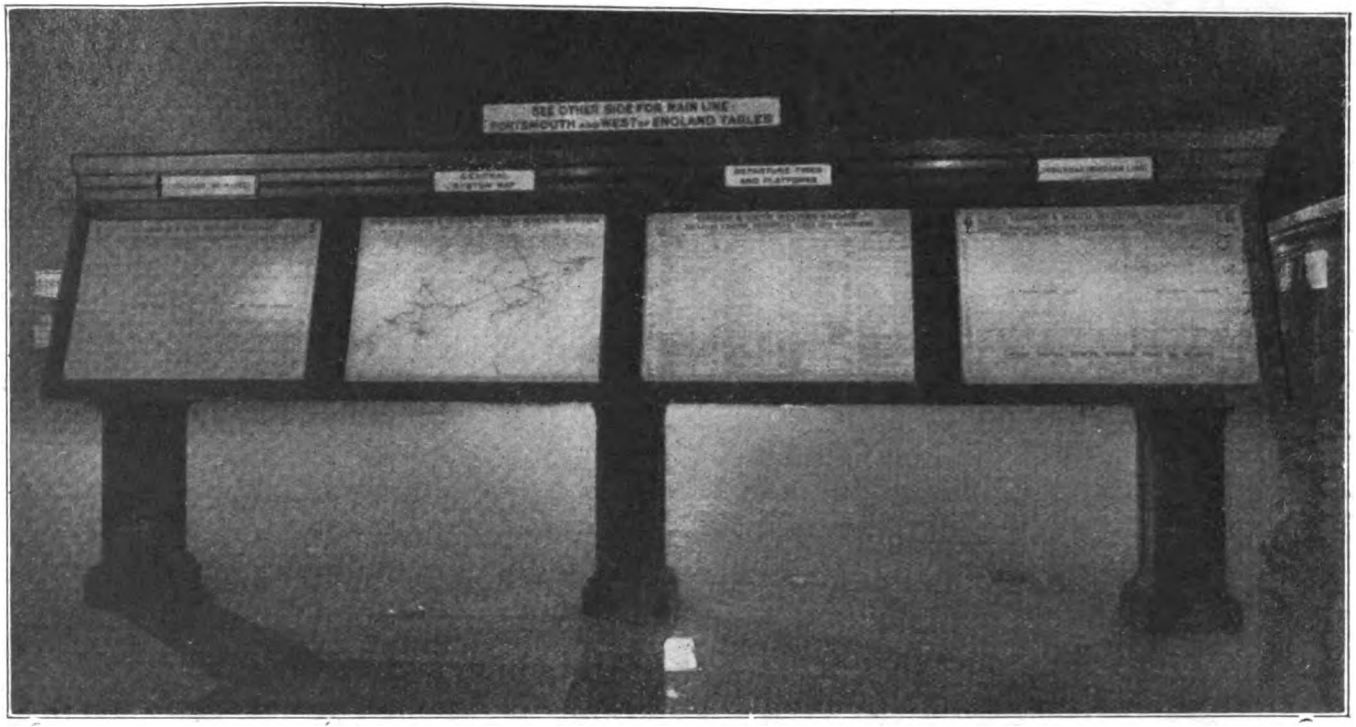
ILLUMINATED TIME-TABLE DISPLAY AT WATERLOO STATION, LONDON & SOUTH WESTERN RAILWAY.



IN order to obviate the difficulty of suitably lighting vertical posters, and to render the consultation of time-table sheets more convenient, the arrangement illustrated has been introduced at Waterloo Station. The time-table sheets are pasted on inclined panels on either side of the stand and illuminated by electric lamps placed between. If printed on reasonably good paper even the smallest figures and letters can be read with ease.

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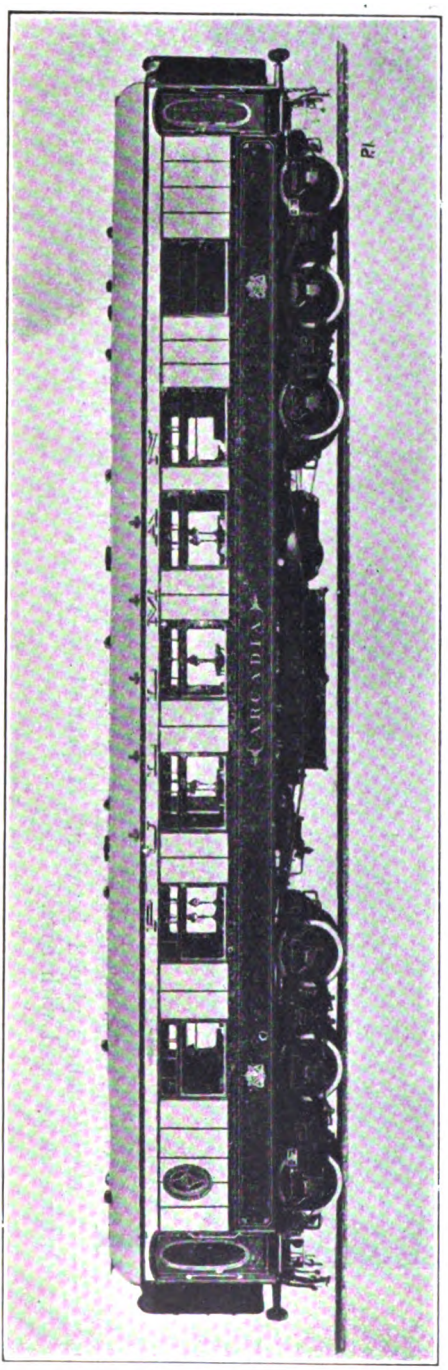
Pullman Cars on the Great Eastern Railway.



PULLMAN CAR "ARCADIA," EMPLOYED IN GREAT EASTERN RAILWAY SERVICES.

WE have already referred to the fact that first, second and third-class Pullman cars are now in service on the Great Eastern Railway, first and third on ordinary trains and first and second on the Continental expresses. These are now illustrated and described. They have been constructed at the Abbey Works of Clayton Wagons, Limited, to the order of the Pullman Car Company, Limited. The first-class car has accommodation for 21 passengers, the main saloon next to the pantry seating nine, the other large saloon seating eight, and the private compartment is arranged for four passengers. Removable tables with glass tops are provided throughout, and where more than two pasengers are served an extension is arranged to these tables. In the large saloon a handsome cabinet surmounted with a clock is fitted against the cross partition adjacent to the pantry. Each passenger has a luxurious armchair, specially designed to afford a maximum degree of comfort.

Each of these Pullman cars is treated individually in regard to the scheme of decoration, the five first-class cars being dealt with as follows:—The first car is the *Arcadia*, in which a specially beautiful effect is obtained by quartered panelling in plum pudding mahogany, tastefully inlaid, the fiddle-backed chairs being upholstered in green buffalo hide, and the carpets also being green. The *Corsair* is panelled in richly figured, mottled and fiddle-backed mahogany, and also has green chairs and carpets. The *Catania* is finished in diamond stripe mahogany, and has red carpets with the chairs upholstered in red buffalo hide. The *Cambria* is panelled in curl mahogany, with green chairs in buffalo hide, and the *Ansonia* is finished in pear wood and has blue carpets, the chairs being upholstered in blue buffalo hide. The cars are equipped with Stone's system of electric lighting, and are heated by means of Laycock's atmospheric steam system. The exterior of each car is finished in the

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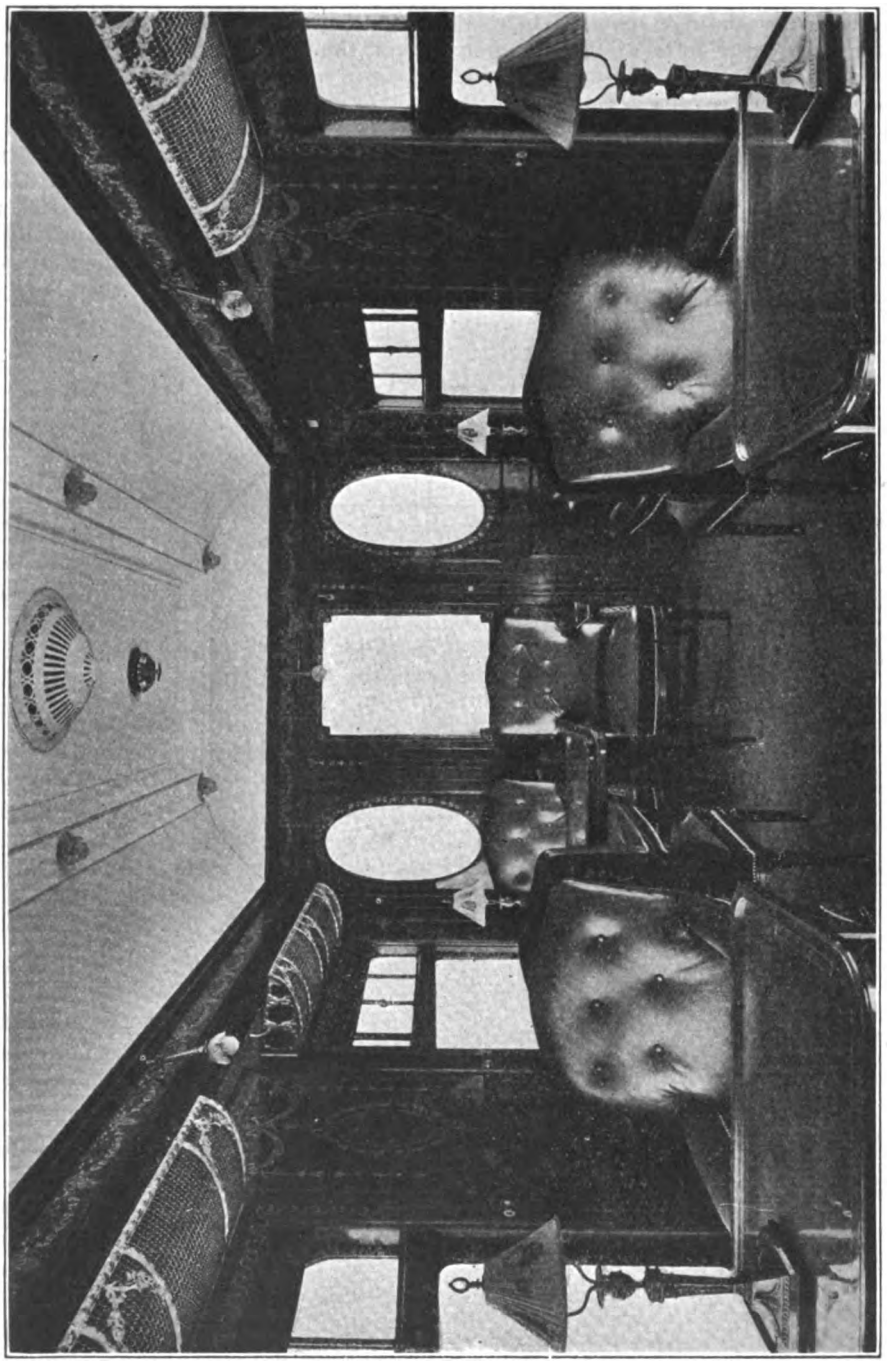

INTERIOR OF PULLMAN CAR RUNNING IN GREAT EASTERN RAILWAY SERVICES.

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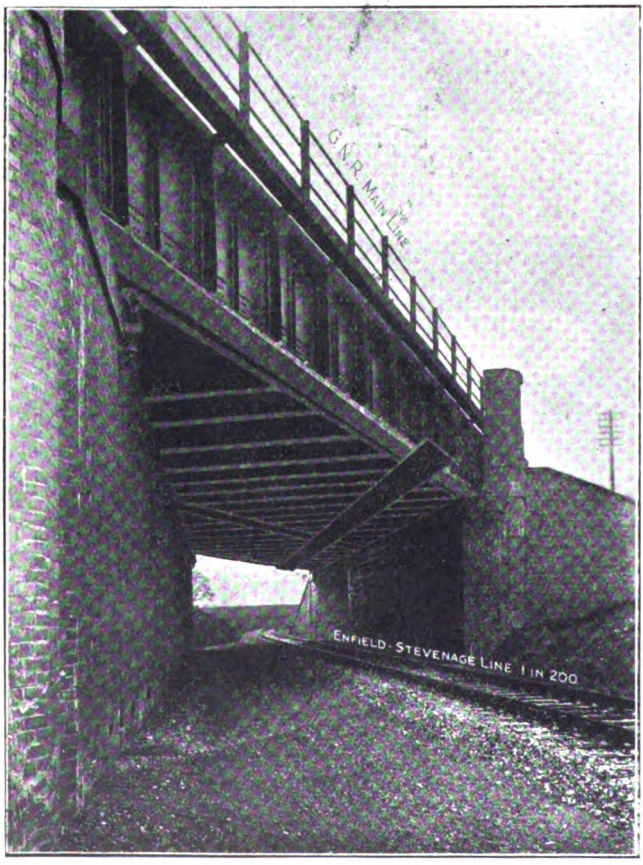
standard Pullman colours, the top panels being cream and the lower portion of the car, fascias, mouldings, &c., of special Pullman olive green. The cars are tastefully lined with gold, the name of each car appearing in large letters on each side. The bogies are of the six-wheeled side compensating beam type.

The third-class cars have the same exterior appearance as the first-class cars, with the exception that in this case the cars do not have distinct names, but are identified by numbers. The interior is divided into two large compartments, seating in all 47 passengers. These compartments are panelled in finely-figured mahogany, tastefully inlaid, and varied for each different car. Three of the cars are upholstered in green duratex, one in green and the other in red friezette. Seats near the central gangway are arranged to tip up so as to afford easy access to the fixed seats against the body sides, each passenger being provided with table accommodation. The lavatory arrangements of this car are similar to those of the first-class car, but greater kitchen and pantry accommodation is provided on account of the larger numbers of passengers to be carried.

ENFIELD & STEVENAGE LINE, GREAT NORTHERN RAILWAY.



BRIDGE CARRYING G.N. MAIN LINES OVER NEW DOWN LINE NEAR ITS TERMINATION.

IN the RAILWAY MAGAZINE for July, 1920, Mr. H. L. Hopwood described the construction and characteristics of this line, designed to provide an alternative route and a second approach to London from the North. At Langley Junction, where connection is made with the main line near Stevenage, the junction is of a "fly-under" character, and the view reproduced shows the skew girder structure by which the main lines are carried over the new down line from Enfield. One track only is laid, but room is provided for a second should that be necessary in the future. We understand that the second track has now been laid throughout the remainder of the new line, where hitherto one only has been in use.

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Third-Class Passenger Travel on Indian Railways.

AT first the native population of India did not take kindly to the railway, but now very large passenger totals are realised on all the leading lines. Thus on one railway alone—the Great Indian Peninsula—the number of third-class passengers conveyed increased from 4,550,439 in the year 1880 to 35,762,729 in 1920. This remarkable increase in the number of third-class passengers handled has been common to most of the Indian lines; and it is probable that in future years the spread of education and the increased prosperity of the country will result in a steady growth in this class of traffic. In the transport of both individual passengers and the huge parties of pilgrims constantly passing to and from the holy places the railways have proved a tremendous boon to the natives of India, and the present-day popularity of third-class travel is evidence of the admirable manner in which the railways have tackled the difficult problems such a business involves. The old third-class vehicles, which in some instances resembled a slightly superior type of cattle truck, have been replaced by comfortable coaches of modern design and to-day the third-class bogie coaches in service on the Indian railways compare very favourably with third-class vehicles in use in other parts of the world.

Having modernised their third-class passenger coaches attention is now being centred on the improvement of third-class passenger station accommodation. These improvements are chiefly taking the form of the remodelling of the waiting-shed accommodation and the provision of additional and more suitable refreshment rooms and food-stalls, fountains and bathing places.

Unlike the English traveller, who invariably makes the least possible use of the station waiting rooms, the native of India, to whom time appears of little moment, usually arrives at the station from which he is to commence his journey several hours before the booked time of departure. This curious custom, in the absence of suitable waiting accommodation, resulted in the blocking of station premises by crowds of waiting travellers.

To overcome these difficulties improved and additional waiting-shed accommodation is now being provided at many Indian stations. A view is reproduced showing a third-class waiting-shed recently erected by the Great Indian Peninsula Railway at Bhusaval. The shed is 118 ft. in length and 98 ft. in width, and is, as will be seen, a particularly lofty structure.

Coupled with the provision of additional and more suitable waiting-sheds at stations dealing with third-class passengers in considerable numbers there is proceeding the provision of increased and improved refreshment room and food-stall accommodation. At the larger stations substantially-built third-class refreshment rooms are being provided, and at the smaller stations existing tea and sweetmeat stalls placed on the platforms are being extended, and new stalls furnished where necessary.

Third-class travellers on the Indian railways are made up chiefly of Hindoos and Mahomedans, and owing to their varied religious beliefs it has been found necessary to provide separate refreshment room accommodation for each. Again, the refreshments to be provided vary in different parts of the country according to local custom and demand. All these obstacles are, however, being satisfactorily overcome, and the needs of third-class travellers adequately met. The Great Indian Peninsula Railway Company have made such arrangements as will ensure licences for the sale of foodstuffs and sweetmeats being granted only to approved

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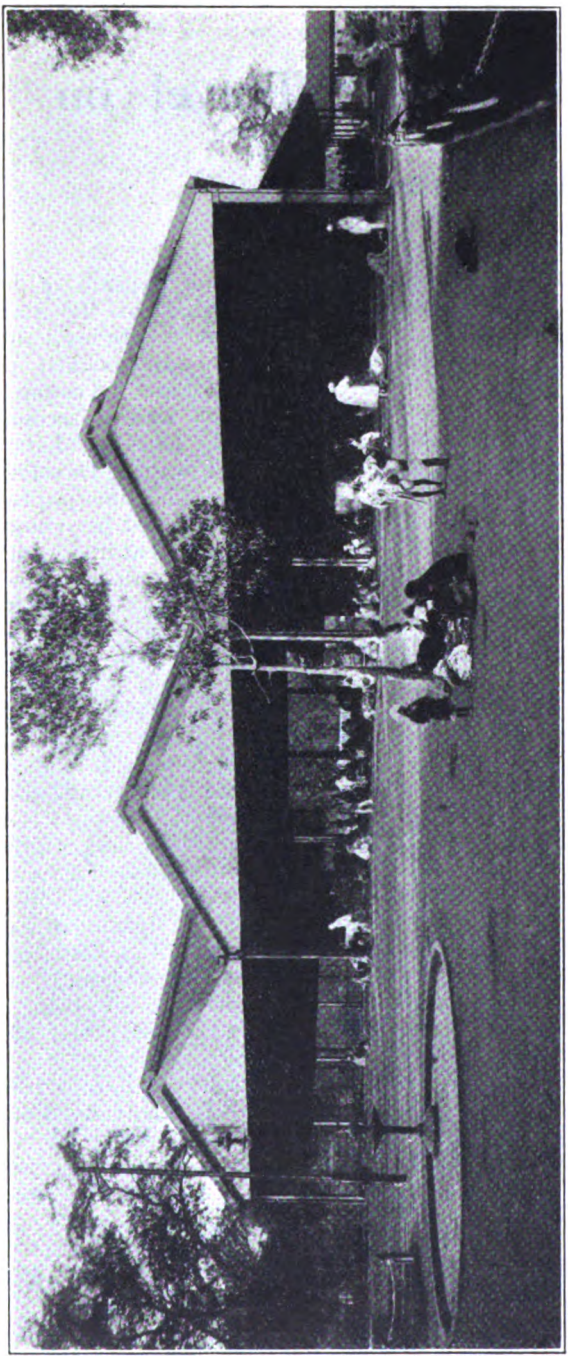

THIRD-CLASS WAITING SHED, BHUSAVAL, GREAT INDIAN PENINSULA RAILWAY.

vendors, and standard prices have been fixed for all articles. Hindoo and Mahomedan food inspectors have been appointed to supervise the working of the refreshment rooms and stalls, and stationmasters have received instructions to reject all stale, unwholesome food, and to assist in the maintenance of a high standard of cleanliness.

Bathing is essential for the Hindoo partaking of a meal after a railway journey, and to meet this need bathing-places are being provided at many important stations. Improved arrangements for the supply of drinking water at stations for both Hindoos and Mahomedans are also being installed. In addition there is being provided additional and improved latrine accommodation at all stations dealing with third-class passengers in considerable numbers.

Having regard to the many difficulties involved owing to the necessity for observing scrupulously the religious and social customs or prejudices which exist in the various provinces, progress in the improvement of the station accommodation provided on the Indian railways during recent years has been remarkably rapid, and it appears certain that the conveniences now being introduced will result in a very considerable growth in the volume of third-class passenger traffic handled.

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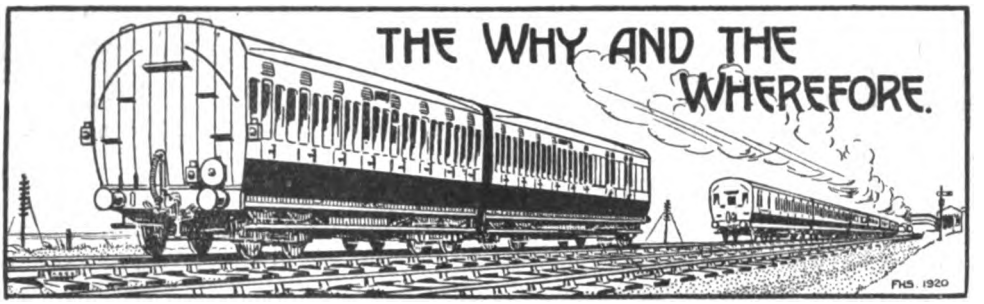

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book." The twenty-fourth Annual Edition of this standard railway reference work is now on sale, 5s. net, or by post from the* RAILWAY MAGAZINE *Offices, 5s. 9d.*

Cape to Cairo Railway.

We understand that railway communication at present reaches as far as Bukama from the south, but that nothing tangible has yet been done on the proposed extension of 80 km. along the River Lualaba to reach a point whence larger vessels can be employed. To Bukama there is continuous rail communication from Cape Town for a distance of 2,700 miles. Thence river communication has to be used to Kongolo, rail to Kindu, river to Ponthierville, and rail to Stanleyville (on the Equator). A railway is projected across the intervening territory to Albert Nyanza, and the Nile has to be used until the Sudan Government Railways are reached, crossing the White Nile on its way westward to El Obeid, at Al Rabak, 200 miles south of Khartoum. We are not aware that any progress has yet been made with proposals for connecting the Egyptian State and Soudan Government railways between Assouan and Wadi Halfa, or for extending the latter southward as required by the Cape to Cairo scheme.

[Reply to "LANCASTRIAN."]

South London Railway.

Between Wandsworth Road and Brixton, virtually as far as East Brixton station, actually to Barrington Road Junction, all lines, including those used only by London, Brighton and South Coast Railway trains, belong to the South Eastern and Chatham Railway. Onwards to Cow Lane Junction, where the South Eastern and Chatham Railway Crystal Palace line crosses over the London, Brighton and South Coast Railway beyond Peckham Rye station, similarly belongs to the London, Brighton and South Coast Railway, including the lines used only by South Eastern and Chatham Railway trains. This division was made in the early days as convenient to both companies, and explains why you saw the London, Brighton and South Coast Railway relaying staff at work on apparently South Eastern and Chatham Railway lines.

[Reply to A. R. COWLISHAW.]

Great Eastern Railway Gradients.

It is only in the first five miles of the main line to Bishop's Stortford that there are any difficulties; the rise at 1 in 70 for half a mile before Bethnal Green, and of 1 in 122 for half a mile to Cambridge Heath with the short fall at 1 in 70 from Hackney Downs, not to mention the severe service slacks at Bethnal Green, Hackney Downs and Clapton Junction, cause express trains to take some 12 or 13 min. over the six miles between Liverpool Street and Tottenham. After that the line rises faintly to Broxbourne, and from there mostly at about 1 in 300-400 to Bishop's Stortford. Other than stations, the most important point for timing is Coppermill Junction, 4·9 miles out.

[Reply to "SUTTONIAN."]

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Late Trains.

Obviously, an occurrence such as that you note of the up Cornish Riviera Express being 115 minutes late into Paddington was due to a special cause (the breakage of a drawhook, as you report), and would not be taken into account in analyses of train running. On any other basis a train which was concerned in a serious collision and which never reached its destination at all might be credited with lateness to any extent. The cause of such special delays might be noted, but train running statistics are usually understood to take account only of running and traffic delays, and not to cover breakdowns of any description.

[Reply to A. J. CUSH.]

London and South Western Railway 0-6-0 Locomotives.

We have no information that Mr. R. W. Urie is equipping any of the 0-6-0 locomotives of the London and South Western Railway with superheaters, but it is by no means improbable that some of those in course of rebuilding may be so fitted. Your other query, concerning diamond shaped boards on London, Brighton and South Coast Railway signal posts, has been answered so many times recently that we must ask you to refer to previous issues of the RAILWAY MAGAZINE, or to the "Railway Miscellany" in the 1921 edition of the RAILWAY YEAR BOOK.

[Reply to "443."]

Locomotive Domes.

You are in error in assuming that additional domes on the boilers of Continental and American engines have any connection with the regulator or the supply of steam to the cylinders. In the vast majority of cases they merely contain sand, the position chosen being with a view to keeping the sand in a dry condition. The second dome on the London, Brighton and South Coast 4-4-0 you mention, however, contained experimentally a Hotchkiss water-circulating arrangement; in subsequent double-domed 2-6-0 engines of the same railway the second dome is employed to house the top-feed apparatus.

[Reply to E. L. ORMEROD.]

Weight of East Coast Joint Stock.

There is considerable variation according to type, eight-wheeled passenger coaches weighing 26 to 34 tons (average 30), 12-wheeled coaches, 34–38 tons, and 12-wheeled dining saloons, 39–41 tons. The three-coach eight-wheeled dining "set" used on the day *Scotsman* weighs 98 tons. Corridor eight-wheeled brake-vans weigh 23–26 tons. Why not read the weights yourself from the ends of the vehicles, just under the roof, as you live on the East Coast route?

[Reply to "NEWCASTLE."]

London, Brighton and South Coast Railway Locomotive No. 46.

We are advised by Mr. L. Billinton, Locomotive Engineer, London, Brighton and South Coast Railway, that this engine has been fitted with a class I_3 superheater boiler, though the existing cylinders and "D" type slide valves are retained without alteration, lubrication of the front end being effected by a hydrostatic lubricator. The engine also has an extended smokebox, but is not otherwise altered.

[Reply to W. CAVAN.]

The "Warning" Arrangement.

This is virtually equivalent to permissive working, as may be gathered from the article on the Lancashire and Yorkshire Railway School of Signalling in the April number. In effect, within the congested areas and on the goods lines freight trains are frequently allowed to be brought forward after being warned that the section is not clear for them throughout, and they must be prepared to stop short of a train in front.

[Reply to W. S. UPTON.]

Platforms "On Either Side."

You have not appreciated the fact that at busy underground and tube stations entraining passengers must wait the passing off of detraining passengers, owing to the congestion of the central passage-ways and end doors of cars, especially those without middle doors. There would be some gain, but the cost of alteration, could it be carried out, and of additional staff, would hardly be sufficiently compensated for.

[Reply to W. CAVAN.]

Single-line Sections, Great Western Railway Main Line.

These are situated beyond Plymouth between Royal Albert Bridge and Saltash,

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42 chains in length; Scorrier and Drump Lane (Redruth), 1 mile 58 chains; St. Erth and Marazion, 3 miles 57 chains; and Posandane Siding and Penzance, 54 chains. Last-named is in course of being doubled. All these sections are operated by the electric train staff.

[Reply to "GLAN-EBBW."]

Fowey Branch, Great Western Railway.

All Fowey branch trains from Par must reverse at St. Blazey. In a number of cases the Newquay and Fowey branch trains run attached between Par and St. Blazey and are there divided. Fowey is a through station, and most of the branch trains work through between Lostwithiel and Par *via* Fowey and St. Blazey.

[Reply to "GLAN-EBBW."]

Mono-rail Railways.

The only mono-rail line in the British Isles operates between Listowel and Ballybunion in the west of Ireland. This is on the Lartigue system, the trains running on elevated trestles, and must not be confused with the Brennan gyroscopic system. Your other query is not explicit.

[Reply to "WATERLOO."]

Destination Boards on Electric Trains.

The question of providing destination boards on London and South Western Railway electric trains frequently comes up, but for certain reasons the traffic department of this line does not consider it necessary; moreover, staff for train labelling and stocking boards would be required.

[Reply to R. W. N. S.]

Snifting Valves.

The devices you have noticed on Great Eastern Railway superheater locomotives are the snifting valves used for allowing air to escape from the cylinders when running without steam, and to act as release valves for air or steam circulated through the superheater elements when steam is shut off.

[Reply to G. B. D.]

London, Brighton and South Coast v. South Eastern and Chatham "Moguls."

On the basis of nominal tractive effort the South Eastern and Chatham engines are slightly the more powerful of the two; this is mainly on account of the 200-lb. working pressure in the latter case, as against the London, Brighton and South Coast 170 lb. [Reply to "BUFFERS."]

Bell Signalling.

For each line concerned there are, of course, separate instruments, and the bells for each have readily distinctive tones, or bells are used for one direction and gongs for the other. In any case the signalman must refer to his instruments. [Reply to W. D. SPENCER.]

4-6-0 Locomotives.

First engines of this wheel arrangement in the British Isles were designed by the late Mr. David Jones for the Highland Railway in 1894. We cannot understand your other difficulty; our answer did not state that the engines had consecutive numbering.

[Reply to G. M. MACKAY.]

Dumb-Buffered Wagons.

Spring buffers are compulsory for wagons used on open lines, but dumb-buffered wagons may still be used departmentally and about yards and depôts. Presumably, though in a passenger station, the wagon you saw was thus utilised, probably for the reception of waste and station refuse.

[Reply to W. CAVAN.]

Loading Gauge, Metropolitan Railway.

Height is limited on the Underground sections to 12 ft. 8 in., though north of Finchley Road the more usual height of 13 ft. 6 in. is available. On the Metropolitan District Railway the limit is 12 ft. 6 in. In both cases permissible width is 9 ft.

[Reply to J. MALLET.]

The Guaranteed Day.

Each day has to stand by itself, so that if engine duties do not complete the standard eight hours the men are usually employed on shed or miscellaneous work for any spare time. An excess one day cannot be used to balance a shortage on another day.

[Reply to W. S. UPTON.]

Engine No. 740, London and South Western Railway.

This is a 6-ft. 7-in. 2-cylinder 4-6-0 engine of the latest Urie type. You are confusing it with the Drummond 4-2-2-0 engine No. 720, which has four cylinders driving in pairs the two uncoupled driving axles.

[Reply to "FULL SWELL."]

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Rebuilt 4-4-0 Engines, Great Eastern Railway.

Rebuilding of the "Claud Hamilton" class with superheaters, irrespective of the original batch to which they belong, brings them into a class of uniform design, and accounts for the bracketted classification.

[Reply to "INTERESTED."]

Longest Platforms and Tunnels.

Waverley Station, Edinburgh, has the longest platforms, 1,680 ft., in the United Kingdom. The Severn Tunnel is the longest, 4 miles 624 yards. For information of this class see the RAILWAY YEAR BOOK the new edition of which is now available.

[Reply to P. R. GRIMES.]

2-8-0 Engines on the South Eastern and Chatham Railway.

We presume you refer to R.O.D. engines returned from war service and running on this railway; they are of the standard Great Central Railway mineral engine type.

[Reply to "BUFFERS."]

Oil-fired Engines on the Great Central Railway.

There is now, we believe, one engine on this railway burning oil fuel only. One 2-8-0 engine has been fitted to burn colloidal mixture, which is composed of oil and pulverised coal.

[Reply to C. R. HODGSON.]

Rebuilt Engines, Midland (London, Tilbury & Southend Section) Railway.

As these engines go into Derby shops for re-boilering the extended smokebox is fitted, and in course of time will become general on the London, Tilbury and Southend section.

[Reply to "INTERESTED."]

Locomotive Tractive Efforts.

Please be more explicit. Wheel arrangements mentioned cover a number of different types in each case, and we cannot spare space to give the information you solicit in respect of all of them.

[Reply to C. R. HODGSON and "N/C."]

Wotton Tramroad.

An extension to Oxford was projected many years ago, and, presumably, was surveyed, but the scheme did not eventuate, and there is little likelihood that it will be brought forward again.

[Reply to J. V. HUGHES.]

Electric Train Tablets.

We note your remark that these are sometimes made of "rubber fibre" instead of metal Your suggestion as to varied colours is a good one, and is, we understand, adopted in some instances.

[Reply to Rev. G. WEST.]

Single Track Lines.

We must ask you to refrain from further inquiries as to single line sections of various routes. To answer them often involves investigation of an extended character which cannot always be undertaken.

[Reply to A. R. MIALL.]

Great Central Railway Train Running.

You are correct in stating that the distances and times between Brackley and Woodford should be 9¾ miles and 12½ min., instead of 19¾ and 22½ respectively.

[Reply to E. M.]

Locomotive Depôts.

See the new edition of the RAILWAY YEAR BOOK, which includes particulars of locomotive depôts and positions where the number plates are attached to engines on most of the leading railways.

[Reply to J. P. GILES.]

Wimbledon & Sutton Railway.

Work has not yet been commenced to any substantial degree on either this line or the proposed connection between the Central London and the London & South Western Railway at Shepherd's Bush.

[Reply to J. MALLET.]

Great Northern Railway Locomotives at Newcastle-on-Tyne.

The two 0-6-2 Great Northern Railway tank engines were on their way from the builders in Glasgow to the Great Northern Railway system.

[Reply to H. STONE.]

4-4-2 Tank Engines, Great Northern Railway.

Since the advent of the new 0-6-2 tank engines, the 4-4-2's have been removed to various country sheds for branch line working.

[Reply to "FULL SWELL."]

Locomotive Exchanges.

This information has several times been given. See the "Railway Miscellany" in the new edition of the RAILWAY YEAR BOOK now published.

[Reply to G. B. D.]

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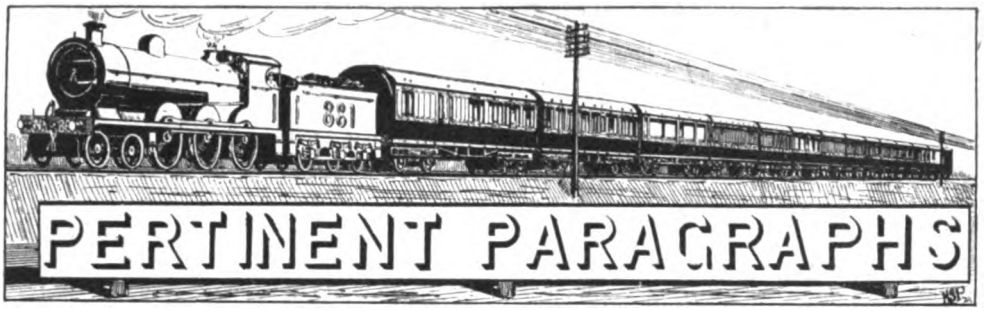

A Railway Settlement in Sight.

At last particulars are available as to the long-promised Government Bill to decide the future position of the home railways, and in conjunction with several important announcements in Parliament and elsewhere it would appear that some of the most thorny problems of the railway situation are within sight of settlement. It was suggested in the report of Lord Colwyn's Committee on Railway Agreements that outstanding claims by the railway companies against the Government in respect of deferred and arrears of maintenance arising out of the war user of railways, &c., might amount to £156,000,000, though as no claims had been made this was admittedly an approximate estimate. The Bill provides for a settlement of these claims, by payments, one at the end of this year and the other twelve months later, amounting to £60,000,000. For some reason great stress has been laid upon the fact that £9,000,000 of this would probably be returned in the form of income tax, but as this applies, or does not apply, in the ordinary way, according to the allocation of the money, this attempt to belittle the payment must be regarded as akin to "window-dressing." However, it is a good thing that this very complicated aspect of the railway settlement is at least provisionally agreed upon, as it will avoid long drawn out and necessarily expensive litigation, and will be welcomed probably as much by the railway accountants as by the Treasury and Ministry officials. It must be pointed out, however, that payments have been made for several months since Lord Colwyn's Committee reported, and the usual procedure will continue until the end of control, so that the alleged saving of £105,000,000 acclaimed by the general press is a very much exaggerated version of the transaction, especially as £156,000,000 was a most unreliable estimate upon which to base comparisons. In any case the settlement, even if it only saves £10,000,000 or so, is opportune and indicates that both the railway companies' representatives and those of the Ministry of Transport are ready to accept a reasonable compromise, and that the former are not out to strain the letter of every war-time agreement to its limits in order to extract the last available pound from the national exchequer, as certain newspapers would have us believe was their intention. This settlement appears to be dependent upon the acceptance of the Government measure, but whether that is subsequently amended or not, there is no doubt that the main provisions of this agreement will remain.

The New Grouping Scheme.

As first promulgated the Government proposals for the grouping of railways met with very limited approval, and were condemned in nearly every quarter of importance. As an alternative the Railway Companies' Association produced a four-group scheme. The new proposals of the Government Bill represent in some degree a compromise between the two by combining the Eastern with the North Eastern group, instead of isolating the North Eastern and Hull and Barnsley Railways in a group by themselves. There will thus be four English groups (apart from the London local lines): Southern (L. & S.W., L.B. & S.C., and S.E. and L. C. & D. Railways), Western (G. W. and Welsh Railways), North Western and Midland (L. & N.W., L. & Y., Mid., N.S., Furness, and M. & C. Railways), and North Eastern and Eastern (G.E., G.C., G.N., N.E. and H. and B. Railways), Two Scottish groups are proposed, West Scottish (Cal., G. & S.W. and H. Railways) and East Scottish (N.B. and G.N. of S. Railways). In all cases various local and leased or worked lines are to be associated. The separation of the Scottish lines from their English associates remains, however, a bone of contention. The Scottish companies claim that they are most seriously placed by the changed conditions, and the general view of the companies seems to be that the only logical course is to associate them with the appropriate English companies. It remains to be seen how far the new proposals are really "agreed upon in principle," as suggested in remarks by the Minister of Transport, and it may be anticipated that this part of the Bill will be severely criticised

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and possibly amended in vital respects ere it passes into law.

The Railway Staff Problem.

THIS, which bade fair to be a most serious factor in the post-control period, is in process of satisfactory settlement. The claim that Union representatives should be given places on the respective boards is abandoned. It could hardly have been seriously claimed, and was only brought up on the basis of somewhat loosely-worded statements in the Ministry of Transport proposals published last year. The much more valuable alternative, and one as to which there has never been serious objection, that the Central Wages Board shall be continued, including equal numbers of railway officials and railwaymen's union representatives, has been accepted. The National Wages Board provides a court of appeal. The agreement between the Companies' and Union representatives clearly defines the scope of these boards, and of the district councils to be associated with them, while under other headings suitable provisions are made which should effectually remove all fear of serious differences between the railway companies and the railwaymen's unions complicating the release of the railways from control and the readjustment of the railway situation as a whole from August next.

Railways and the Coal Strike.

IN order to conserve existing stocks of coal, and in some instances, owing to actual shortages or the small reserves, train services were subjected to more and more drastic pruning, and by the beginning of May had been reduced by 40–50 per cent., as compared with the normal schedules. This applied to both passenger and goods services, while coal traffic necessarily disappeared almost entirely; but it was not until the later stages that the suburban residential services began to be seriously reduced, though quite early the policy was adopted of restricting travel facilities during the slack hours of the day, and in the later evening and on Sundays. In this respect the companies acted wisely, for the residential traffic depends vitally upon the railways, and is not subject to the reducing effects of the slump in trade and of the cessation of work, due to the fuel shortage, to anything like the same extent as is the normal business travel about the country or the colliery and workmen's traffic, while pleasure travel was advisedly restricted in this time of emergency. On the whole, therefore, the residential facilities for workers in the large towns received preferential treatment, while the long distance, branch line and connecting services were maintained to a reasonable though reduced extent.

A feature of the measures taken was the withdrawal of branch and suburban train services on Sundays, and in the case of the Great Eastern, and later the Great Central and Lancashire and Yorkshire Railways, traffic was entirely closed down on that day, or one train only was run each way on the main routes. Even these trains were provided mainly for milk and similar essential traffic, though in the case of some companies this traffic was conveyed by road motors where no train facilities were provided. Owing to the complication which followed the increasingly voluminous lists of trains withdrawn and altered it was necessary on most lines to issue new "strike" time-tables, and in some instances there were two or even three issues of these. Many restaurant cars were withdrawn. On the Underground lines, stations were opened later and closed earlier.

As it was impossible for the railways even to attempt to cater for Whitsuntide travel the usual course was to require passengers to book beforehand and to restrict the issue of tickets to the available accommodation, while on most lines the Whit-Monday service was restricted to the Sunday arrangements. Unless measures of this class had been taken obviously it would have been quite impossible to cope with the traffic, except by providing an approximation to the normal services over the holiday period, a course which could not be contemplated.

Oil Fuel and the Coal Situation.

IT is only to be expected that during the coal shortage comments should be made as to alleged lack of foresight in the very small provision made in regard to oil fuel locomotives. Thus one critic remarks that "It is recognised that the great necessity in these times is to ensure distribution of essential commodities throughout the country, and had we been in possession of a number of oil-burning locomotives on each great railway, there would be far less expense than commandeering large fleets of lorries."

This is all very well as far as it goes, but it must be apparent to anyone at all familiar with railway working that a large number of locomotives are required for working even the attenuated services of the later strike period, and provision on even that reduced scale would involve the policy of oil-burning to a considerable degree. It may be that the future will include oil-burning locomotives to an extent hitherto unknown in this country. It is all a question of economics, for there is no doubt as to the practicability of using oil in locomotive boiler fireboxes, according to

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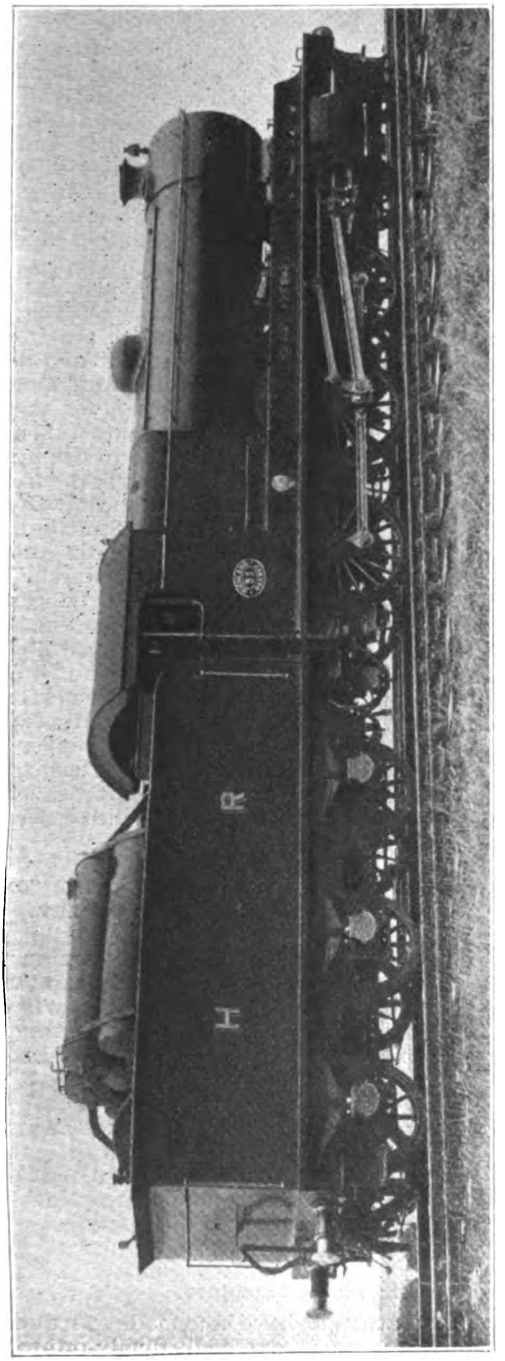
the Holden, the Scarab, or other systems. The main issue is that of cost, and it has yet to be shown that oil is cheaper than coal. But the circumstances of a strike must be abnormal, even although such conditions evidence a lamentable tendency to periodic recurrence, and however desirable such measures may be in times of stress and difficulty they cannot be recommended merely from that point of view. Oil as used for internal-combustion engines and that suitable for steam raising are of essentially different qualities, and the quantities required bear no comparison. There is much to be said for the extension of the use of oil as boiler fuel, and strike circumstances may favour a wider policy in this respect. In fact quite a number of locomotives have been fitted for oil burning, and at the great railway power stations, Lots Road, Neasden, and others, some or all of the boilers have been adapted for oil fuel. But the trouble in the past has been that with a wider demand the cost of oil has risen, and the situation is still very doubtful as to whether it can show direct advantage over coal. Did the cost of oil remain stationary things might be different, but, unfortunately, when the price of coal is high oil is liable to show the same tendency with a largely increased demand.



HIGHLAND RAILWAY LOCOMOTIVE, No. 53, "CLAN STEWART," FITTED FOR OIL-BURNING ON THE SCARAB SYSTEM.

British Railways in 1920.

A PRELIMINARY statement of returns relating to the standard gauge railways of Great Britain for 1920 has been issued. Information given is much more extensive than that in previous preliminary returns, and it also embodies the results of statistics compiled for the first time in 1920. Total capital expenditure was £1,158,700,000 in 1920, as compared with £1,153,300,000 in 1919, and £1,134,100,000 in 1913. On revenue account total receipts, including Government compensation, were £297,800,000 in 1920, and £226,100,000 in 1919. Total receipts for 1913 were £129,700,000. Figures for total expenditure are given as £250,800,000, £179,300,000, and £83,500,000, and the net receipts as £47,000,000, £46,800,000, and £46,200,000, respectively, for 1920, 1919 and 1913. The total net income in 1920 was £51,300,000, as against £51,200,000 in 1919 and £49,800,000 in 1913.

Mileage of lines open for traffic, *i.e.*, total single track, including sidings, was 51,248 in 1920, compared with 51,170 in 1919 and 50,425 in 1913. Total engine-miles in the three years were, respectively, 554,459,500, 511,016,000 and 599,737,000. In 1920 engine-hours "in traffic" were 69,555,000; train-miles per train-hour were 12·99 coaching and 7·74 goods; and train-miles per engine-hour, 10·10 coaching and 3·19 goods.

Whilst the number of passengers has shown a progressive increase, being 1,566,834,000 in 1920 as against 1,507,117,000 in 1919, and 1,184,196,000 in 1913, the tonnage of goods and minerals has shown

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the services over the North and South Western Junction line are North London ones, and terminate at Kew (Old or North London Station); in 1858 (November), a through North London service to Twickenham, reversing at Barnes Station—the Barnes curve dates from later—is clearly given. These trains were hauled by London and South Western engines from Kew (North London), and called also at "Kew Bridge," *i.e.*, the London and South Western Kew Station. Is there any documentary evidence that the joint South Western and London and North Western service from Brentford to Willesden, *ever ran*? Mr. F. J. Dunn told me "No; the first passenger train over the North and South Western line were North London ones."

Pertinent Comments on Present-day Problems.

WHENEVER Lord Ashfield speaks he usually has something to say of a striking character, either in the way of shrewd observation or pertinent comment, and in the course of a recent address there were several instances of this. His subject was the education of a railwayman, but principal interest attaches to his remarks concerning various present-day problems associated with railway operation. Emphasizing the need for a grasp of scientific principle and appreciation of the value of method, Lord Ashfield expressed himself thus:—"Quite recently there has been an investigation before the Rates Advisory Committee of the Ministry of Transport into the fabric (I can hardly say scheme) of rates and charges for merchandise traffic which had been built up by the older generations of railway managers since the Act of 1888 laid down what was then thought to be a sound basis. The Deputy General Manager of the North Eastern Railway had the task of trying to explain what this fabric was. First there were the class rates, but these were much the least important group. Then there came the exceptional rates, 80,000,000 of them. There might be considerably more, but no one knew. Then there seemed to come into view an indefinite number of exceptional rates. Was ever a commodity priced with such infinite subtlety? When asked how the mass was to be sorted out and put straight he thought it would take 400 clerks four years. I need hardly say after this that the notion of introducing scientific principle into business is relatively modern. The value of ordered knowledge is patently evident in contrast with this product of the old method of fixing rates. I am told it was something of a jigsaw puzzle. There were special bargains for particular traffics between particular stations all made haphazardly; many the result of compromise between the railway management and the trader; many the result of competition by other means of transport, canal barge or coastwise steamer, or of competition between producing districts for markets. These became focus points, and round them, with such variations as seemed practicable, were fixed rates for similar traffics for adjoining stations. When a point of conflict in these little nebular schemes arose the ingenuity of the rates clerk was sorely taxed and he just made the best he could of a bad job. Well, after the fresh settlement of the question which is now in contemplation, the lessons of the past may teach us to make a good job of it."

What Development in Facilities Entails.

HIS second point was the requirement in business for balanced judgment. "Just at this time the important problem before the Underground Railways is to increase their carrying capacity. This means more trains and longer trains. This means again more rolling-stock. This means again more shed accommodation to store it and more shop accommodation with tools and equipment to repair it. That is only one string of consequences. More trains and longer trains demand more electric current to move them. More electric current means larger sub-stations. The supply to sub-stations means more cables. The feeding of the cables means a greater power plant, and a greater power plant means more ranges of boilers, more coal-handling machinery. That is another string of consequences. More trains and longer trains mean closer signalling, more and shorter block sections, overlapped blocks, longer station platforms, longer lay-byes. That is still another string of consequences. And the problem is not one of simple addition. For truly economical results it may call for an entire re-design. To get all these consequences together skilfully and to adjust each one to the whole scheme needs this balance of judgment.

"The problem is further complicated by the fact that there are limits set to what can be accomplished. The capacity of a track is not indefinitely elastic. There is a maximum number of trains which can be worked in safety. There is another maximum which can be worked with the most dispatch. To overload a track is to slow up the speed of operation. There is a maximum current supply which at a given pressure can be passed through a track rail. There is a minimum distance between stop signals for safety at a given speed."

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The Casualness of Observation.

On this subject Lord Ashfield made several interesting remarks, to show how unreliable casual observation may be, and the need for analysing results on the basis of carefully-interpreted statistics. Here again, he illustrated his comments from Underground experience. "There has been an increase of fares on the Underground Railways. The fares were put up on the average 30 per cent. The receipts at the end of the third week were up 23 per cent. There was 7 per cent. missing. This difference had to be explained. The passengers were found to number 10 per cent. less. This more than explained the difference, for 90 per cent. of the passengers with 30 per cent. increase in fares could only give at the best 17 per cent. increase in receipts; and so a further explanation was wanted. The increase of fares had not been uniform over all fares; it was higher on the short and medium-distance fares, lower on the longer-distance fares. The passengers, too, did not spread themselves out uniformly over all possible journeys. There were more who took short and medium-distance journeys than longer-distance journeys. The percentage increase in fare was based on a simple arithmetical average, the expected percentage increase in receipts must be a percentage based on an average, weighted by the distribution of the passengers over all the rates of fare. This corrected percentage was almost 35. Ninety per cent. of the passengers paying 35 per cent. more in expected average receipts would only show an increase in total receipts of about 21 per cent., so that there was still a difference and still it was a shortage. And the tale was completed, outside of the region of exact figures for the moment, by the bringing to account of a transfer of passengers from ordinary to workmen, by the adjustment of journeys which passengers will always make to avoid the last penny in the fare, by a growth in the season ticket traffic. This pursuit of figures is very fascinating, but the successful pursuit calls for considerable intellectual ingenuity. Any natural gift for figures needs assiduous cultivation."

Cheap Railway Travelling in Early Days.

An old poster issued in February, 1856, under the joint signatures of the then General Managers of the London and North Western, Manchester, Sheffield and Lincolnshire, and Midland Railways, is reproduced, and many Railway Magazine readers will envy travellers of that day. A certain historic interest attaches to the exceptionally cheap travel arrangements set forth, for this was long before the days of long-distance half-day and day excursions at the very cheap fares with which we were familiar during the years preceding the war. Indeed, the arrangements applied to ordinary trains and were the usual fares then operative. During the later months of 1855 the Manchester, Sheffield and Lincolnshire Railway had become a bone of contention in that, while it was then working in close association with the London and North Western Railway, the Great Northern Railway was very anxious to obtain a share of the traffic of the district west of Sheffield. As a result keen competition was inaugurated. As far as we can ascertain the London and North Western began the rate war on February 1, 1856, and the poster reproduced advertises one of the series of trains at greatly reduced fares. The poster is dated February 9, whereas it

London and North Western,
Manchester, Sheffield and Lincolnshire,
and Midland Railways.

The Public are informed, that on and after the

11th FEBRUARY, 1856,

And until further Notice, the above Companies will continue Working

FAST TRAINS

BETWEEN

SHEFFIELD,

VICTORIA STATION.

AND

LONDON

At a further Reduction of Fares, and at Times as under:

UP TRAINS.		A.M.	P.M.
Sheffield Victoria Station	dep.	11. 0	5.30
London - -	arr.	4. 0	10.20
DOWN TRAINS.		A.M.	P.M.
London - -	dep.	9.45	5. 0
Sheffield - -	arr.	2.30	9.45

FARES EACH WAY:

First Class, 11s. 3d.
Second Class, 5s. 8d.

NOTE.—The Fares to and from London by the above Companies' Route will in no case exceed those charged by any other Company.

By Order, MARK HUISH, JAS. ALLPORT, ED. WATKIN.

Feb. 9th, 1856. W. Lemaire and Sons, Printers by Steam Power, Derby.

AN OLD RAILWAY POSTER OF 1856.

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was not until the 11th that the Great Northern began to cut its rates to correspond, but that this action was anticipated is shown by the note stating that "fares to and from London by the above companies' route will in no case exceed those charged by any other company." Competition extended to various destinations, and it is on record that the first-class fare from London to York fell to 5*s*., while the second-class fare from Euston to Peterborough was reduced to 1*s*. This rivalry did not last for very long, as the cheap fares were withdrawn on March 1, and the services of Mr. Gladstone were enlisted as arbitrator.

It should be borne in mind that the Midland Railway then reached London *via* other companies' lines, the standard route being *via* Rugby and Leicester. Presumably, trains after leaving the Victoria Station at Sheffield of the Manchester, Sheffield and Lincolnshire Railway transferred to the Midland in the Sheffield district. The fares may be compared with those of to-day, which are, first-class single, £1 16*s*. 7½*d*., and third-class, £1 2*s*. 11*d*., there being now no second-class fares. The best time (by what would now be regarded as an indirect route) of 4 hrs. 45 min. compares quite creditably with the best time to-day of 3 hrs. 22 min. by the 3.15 p.m. ex Marylebone.

Mr. Arthur Watson on "Train Control."

ADDRESSING the members of the Institute of Transport recently, Mr. Arthur Watson, C.B.E., General Manager, London and North Western and Lancashire and Yorkshire Railways, presented a very clear summary of what train control involves and how it benefits train operation. To avoid any misunderstanding, he pointed out, in introduction, that train control, which is a system of regulating the movements of trains in order to carry the traffic expeditiously, conveniently and economically, notwithstanding its wide variations, has nothing to do with automatic train control, a signalling matter entirely. The general features of train control were summarised thus:—

"During the last few years considerable attention has been given by railway companies to the installation of control systems, and it is very important that the system which is introduced on any company's line should be such as to best meet the particular needs of that company's traffic. Whilst, therefore, every system of control should embrace certain defined principles, in giving effect to those principles, the type of the system may differ in form, having regard to the particular problems to be dealt with by the company concerned; for instance, on one company's line the bulk of the work may be the running of important through trains, or the majority of the work may be through running between various 'pools' or marshalling sidings, and may be regarded as that portion of a railway company's business which, amongst the trading community, is known by the term 'wholesale.' On other companies' lines the 'pick-ups' and branch trains may form the greater part of the work, so that picking up and distributing freight at the point of origin and destination and the terminal work may consume the greater part of the power expended, and in this case the problem requires to be considered from the 'retail' point of view. The class of traffic which needs particular attention and supervision, if the best economic result is to be achieved, is that of freight, as this class of traffic, whilst being the most expensive to deal with, at the same time allows of a quick alteration being made at short notice in the power to be expended, whereas, in connection with the passenger train traffic the advertised trains must be run although on one day a good load may be obtained and on another day only a moderate load is presented. It is therefore essential that the system of control adopted should be such as to allow the fullest advantage to be taken of the type and volume of traffic offering."

Systems of Control.

SEVERAL systems are in use, some based on central and others on district control, with combinations of both methods. Central control also involves sectionalisation, though it is all combined in the one centre. In dividing up the system, however, any arbitrary scheme based on track mileage would be unsatisfactory as, on certain portions of a railway, there is generally a considerable track mileage with comparatively light traffic as distinct from sections composed of shorter mileage, but where the density of traffic is great. There are also other factors to be thought of, such as junctions, goods yards, siding, etc., connections, but, in considering the problem of a train control, one of the most important points is properly to divide up the system, having regard to the producing and distributing points, the marshalling sidings in the various districts to and from which the pick-up services are to run, and the amount of work which it is reasonable to expect the various members of the staff in the control offices to supervise properly.

The provision of satisfactory telephonic communication is important. "With a centralised system of control, I should unhesitatingly say that the proper scheme is to provide independent telephone circuits

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for control work, and that these should further be divided into two classes :—

(1) The telephone circuits dealing with the detail matters reported to the control office, and the detail instructions issued from the control office.

(2) A system of telephone circuits by means of which conferences and conversations can take place between the control office and the most important points, when working conditions arise which necessitate such consultations taking place.

"Having provided a satisfactory system of control to deal with any company's problem from the point of view of (*a*) accommodation, (*b*) satisfactory equipment, (*c*) proper allocation of work, it is necessary to determine what matters shall be placed under the authority of the control. In this connection I should like to say that having made up your mind as to the matters which control is to supervise the authority once given should be so broad as to admit of no interference except under most unusual circumstances, and this point should be covered in the instructions issued to the control by the proper authority responsible for the working of the line. If the control is to be efficient and accomplish satisfactory results, it must be left unfettered and, once having determined that it is to undertake certain work, it should be helped in the achievement of the best results. This does not mean that your control becomes a dictatorship, because the first essential in efficient control is co-operation, but it should be allowed to obtain direct co-operation with the outside staff without the possibility of anyone interfering between the direct relationship in connection with such matters as the control is authorised to deal."

The Work of the Control.

MR. WATSON then reviewed in detail the chief functions of the control system, with particular reference to its application on the Lancashire and Yorkshire Railway. Controlling the running and loading of freight trains it should operate the traffic with minimum freight-train mileage and minimum freight engine-hours. Train working is, therefore, based upon knowledge of connections throughout the system. A normal train service can therefore be added to or reduced, and train working modified as required, or the whole freight service can be scheduled as occasion arises. Ordinary traffic, and especially that to and from collieries or marshalling and exchange sidings, is therefore operated on the basis of information as to the traffic offering, supplies of empty wagons and the movements of all trains. Goods train loads are based upon a gross tonnage, and the scheduled haulage classification of the locomotives, modified, of course, by gradient and other considerations on particular sections. Engine duties, enginemen's relief, provision of assistance, guard's duties, and other matters are all dealt with by the control office or offices, also the concentration and distribution of empty rolling-stock. But as Mr. Watson pointed out, "it should not be assumed that it is possible for every train to be loaded to its full capacity, as it will be appreciated, it is necessary that there should be some trains run to give satisfactory services from a commercial point of view, *i.e.*, the running of pick-ups to connect with the through services, but the scheme does enable such services to be singled out and watched, and indicates the price paid for the running of trains under such conditions. A system of control which allows of such arrangements being watched during the time of the making up of trains and the actual working of the traffic is a great advance on arrangements which merely indicate uneconomical working which has already occurred, instead of preventing the waste of power."

Control is of special value in regard to the regulation of the movement of coal traffic for shipping, and in case of accident the control office is able to minimise any dislocation of traffic arising therefrom. It has also incidental value in that it may enable heavy capital expenditure on widenings, new lines, &c., to be avoided, and it enables a close control to be exercised upon the wages bill.

Train Control Summarised.

THE paper concluded with a very complete summary of what train control does, as follows :—

(*a*) Increases the general efficiency of all movements, and thereby obtains a consequent reduction in operating cost.

(*b*) Increases mobility of stock by the best concentration and distribution of empty goods wagons.

(*c*) Ensures the best allocation and distribution of locomotives (and reduces unproductive time for both power units and personnel).

(*d*) Checks the loading of wagons.

(*e*) Reduces to a minimum power losses due to waste haulage on trains.

(*f*) Provides a sufficiently close touch on the pulse of the system, so that the situation as a whole may be appreciated at any time and consequent adjustment made before troubles become cumulative.

(*g*) Co-operates in obtaining efficiency of the actual personnel, leaving them scope to use initiative and intelligent keenness.

(*h*) Keeps a close touch on all fluctuations and possesses information as to the causes thereof.

(*i*) "Normalises" all traffic as far as possible, *i.e.*, the maximum traffic is dealt with by ordinary scheduled trains.

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(*j*) Provides supervising machinery and directs all exceptional running.

(*k*) Ensures freedom of movement.

(*l*) Utilises all the various factors available to the best advantage.

(*m*) Reduces disabilities to the utmost limit.

(*n*) Utilises running lines to the best advantage.

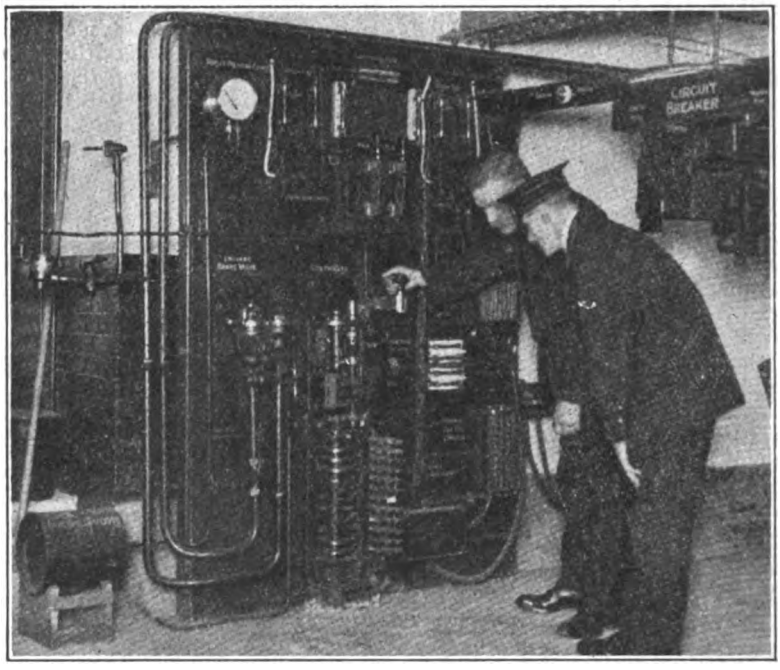
(*o*) Enables the use of the power available to be applied in the best interest of traffic working, both as regards despatch and economy in operation.

(*p*) Puts into force such arrangements as will give the best and most valuable unit of operation on an engine-hour basis.

Training "Underground" Railwaymen.

FOR some years the London General Omnibus Company has had, at Milman Street, Chelsea, near the great power station at Lot's Road, a splendidly equipped training school and centre for omnibus drivers and conductors. Corresponding arrangements on the railway side have, however, been somewhat indefinite, and dealt with here and there in more or less piecemeal fashion. To overcome this drawback, to concentrate all training and qualifying facilities and to enable a definite course of training to be adopted, the associated companies have now provided, adjoining Lambeth (North) Station on the "Bakerloo" section of the London Electric Railway, a school where educational and qualifying work is concentrated in regard to employees of traffic grades on all the railways. This was brought into use on February 4, 1920.

The school premises comprise office, medical officer's room, lecture room, and a cinema hall, while the basement is fitted up with a complete motor control demonstration equipment, with contactors, resistances in place of motors, and Westinghouse brake apparatus, all designed so that employees can operate the control and brake gear as in actual service, and at the same time follow the working of the apparatus. Diagrams and sectional brake models are also provided. In the cinema hall the special training film referred to on page 195 of the March RAILWAY MAGAZINE is shown, with appropriate comment by the lecturer. We were recently privileged to visit these premises when Mr. J. Thornton, Superintendent of the Line, and Mr. E. Yorke, Inspector of Employment and Training (Railways), personally explained the working of the school. During the first year, February, 1920–21, 257 new staff were engaged there, while 433 men of various grades passed through the school for instruction. In addition 320 medical examinations were made in respect of new staff and promotions to higher grades.



CONTROL APPARATUS AND SWITCHBOARD, MOTORMEN'S CLASS-ROOM.

New men are instructed in the duties of booking clerks and porters, which are the preliminary grades, and the training includes

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the study of the "geography" of the railways, the avoidance of accidents and the absolute necessity for courtesy on all occasions. Before promotion to the grades of gatemen, collectors and liftmen, guards and signalmen, and motormen, men who previously passed out of the school as proficient in the preliminary grades, return for instruction. Classes are also held twice a week, open to all grades, for improvement in general knowledge in matters connected with the general working of the railways. After the period of training men are examined, and if proficient, a certificate is issued. This certificate must be obtained before they are allowed to take up the duty for which they have been trained. In addition to the theoretical training the men are sent out on the line for practical training with a competent instructor. All new appointments to the service must undergo a medical examination by the companies' medical officer, and they are again re-examined before promotion to the higher grades.

Euston to Swansea.

"In several recent issues," writes Mr. R. D. James, "there have been references, in replies to correspondents, respecting the Central Wales through coach ex Euston to Swansea. This coach was of a decidedly cosmopolitan character, forming, as it did, the only through, although roundabout, route between several points such as Swansea and Stafford and Rugby, etc. I frequently made use of it, and would point out that in the down morning trip it provided the two little tourist towns of Llandovery and Llandilo with their best London service. The war-time diversion of this traffic to Paddington was not wholly satisfactory from the passengers' point of view. As an instance of this, I quote a personal narration of a Paddington passenger wishing to reach Llandilo by the 10.15 a.m. 'via Shrewsbury,' but was booked 'via Llanelly' to Llandilo. This route would have involved over two hours' wait at Llanelly, and it transpired no bookings operated via Shrewsbury to Llandilo, so the passenger must change and re-book at Shrewsbury. Those of us acquainted with Shrewsbury Station realise this inconvenience, compared to the older London and North Western bookings, which gave Llandrindod, Builth Road, Llanwytyd, Llandovery and Llandilo respectively a two-way service with London and no changes."

This involves an interesting aspect of some of these unusual and apparently paradoxical through carriage arrangements which, in pre-war days, added so much to the travel facilities of the country as a whole. Even from London this roundabout route had its value, but, in regard to important towns *en route*, the service given was directly suitable. It is in regard to facilities of this class that present-day travel conveniences are lacking. No doubt many will return in due course, but it is questionable whether we shall ever again have the same completeness of through carriage and like facilities as in pre-war days, though the future may provide other advantages in partial compensation.

The Cape to Cairo Railway.

In view of the widespread interest taken in this great scheme, reference may be made to an address before the members of the African Society by Mr. Robert Williams. After outlining the history of the Cape to Cairo Railway and the part it had played in the development of the country through which it passes, Mr. Williams dealt with the northern section, and the following extract from his remarks may be quoted :—

"It had long been my desire to arrange for the systematic exploration of the Sudanese side of this [Congo-Nile] Divide, in the hope that possible mineral discoveries would attract the Sudanese Railway south to complete the link between the Cape and Cairo, and thus at last realise Rhodes's dream.

"The opportunity to do this presented itself quite lately. As the result of a paper entitled 'The Milestones of African Civilisation,' which I read before the Royal Colonial Institute in May, 1917, and in which I demonstrated how the various mineral discoveries in Southern Africa were generally found on Divides between river systems, and that these discoveries had led the Cape to Cairo Railway step by step northward, and thus formed veritable milestones marking the progress of civilisation into the interior of the Dark Continent, I had a call from Major C. Christy, who, having read this paper, told me he had spent many years on the Nile-Congo Divide. He informed me that he believed that there was great mineral wealth on this Divide, and that he was confident that if I would provide him with a letter showing that he had my support and co-operation, he could obtain a concession for minerals in that region from the Sudanese Government.

"I therefore gave him the necessary letter, and as a result he obtained a concession giving him the right to prospect for minerals over an area of some 60,000 square miles of country along the Sudanese side of the Divide. It is to be hoped that this expedition, now at work under Major Christy, will succeed in discovering mineral wealth enough to justify carrying the railway southward, in which case the line will run along the

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Nile-Congo Divide to the Kilo gold mines, whence it will connect up with the length of railway line from Stanleyville to Ponthierville, which already links up the lower and higher navigable portions of the Congo, thus forming a complete rail and river route between the northern and southern extremities of the African continent."

Electrification of the St. Gothard Railway.

WRITING in reference to the article under this title published last month, Mr. D. Marples, of Lausanne, Switzerland, sends some interesting remarks concerning this line: "On the Swiss-German side electric traction now commences at Erstfeld, at the base of the steeply-graded section, and will shortly be completed as far as Bellinzona. Engines were changed, when I travelled, at Castione, a small place 3 kilometres from Bellinzona. The electrified section was then 100 miles long. Further electrification work is in hand, posts being installed as far as Küssnacht, 17 kilometres from Lucerne. On the other side they have been erected beyond Lugano, but no wires have yet been put up outside the Erstfeld-Bellinzona section. On both journeys, going and returning, we were hauled by a large Oerlikon 2-6-6-2 locomotive (series 14250). On the first occasion the train weighed 380 "tonnes," chief guard's figures, and on the return journey slightly more. Good time was kept. One specially appreciated the cleanliness of electric traction in the tunnels going up the steep grades. The maximum speed these locomotives are allowed to go is only 60 km. (37½ miles) per hour, but it is quite sufficient for this steeply-graded section, where a high tractive effort is more important than speed. The section from Bern to Thun via Münsigen was electrified in 1918, and served more or less as an experimental section. The small 2-6-2 locomotives of the 11200 series are employed on this section at present, as well as other types. Another feature you did not mention is that all the electric telephone and telegraph wires have to be buried on account of the perturbing effects due to induction. This is certainly a disadvantage of the monophase system. The three-phase section of the Simplon tunnel has been extended down the Rhone valley, actually as far as Sierre, I believe, if not further."

RAILWAY YEAR BOOK. 1921.

(Railway Publishing Co., Ltd., 30, Fetter Lane, E.C.4. 5s. or 5s. 9d. post free.)

"A compact and representative review of the railways of the British Empire and other countries where British capital is interested. This year's volume shows careful revision, and the facts presented respecting our great transport systems are more complete than ever before. The book contains 44 maps, important statistics and data, and a complete bibliography devoted to railway history, finance, operation and engineering. The whole of the overseas information is brought up to date, and the Ottoman and Mesopotamian railways are introduced. The volume, which is larger than its popular predecessors, is a remarkable publication, absolutely essential to all engaged in railway finance, investment and working. It is a tribute to the enterprise of the publishers that the book includes the official announcement, dated March 24, of the proposed amalgamation of the North Western and Lancashire & Yorkshire Railways."—*Financial News.*

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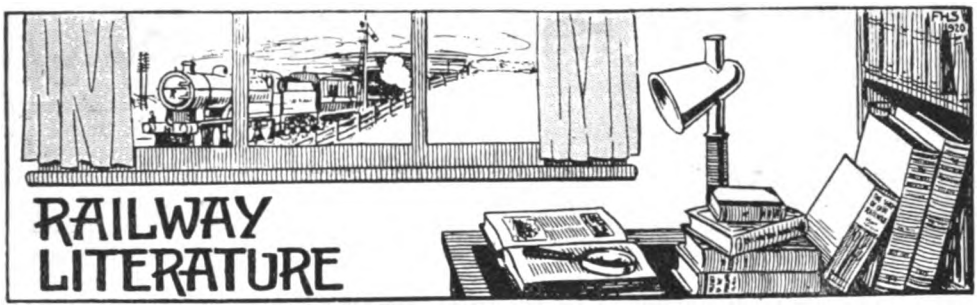

THE STEAM LOCOMOTIVE. By E. L. Ahrons. [Sir Isaac Pitman & Sons, Limited. Price 2s. 6d. net.] Following his useful little volume on "Steam Locomotive Construction and Maintenance," reviewed last month, the publishers have added a companion volume to their "Technical Primer Series," dealing with steam railway locomotives generally. In ten chapters, Mr. Ahrons describes the chief parts of the locomotive engine and their functions, simply, yet sufficiently technically to meet the needs of those who desire to understand how the locomotive is constructed and how its components operate, without necessarily desiring to proceed with the more advanced phases of locomotive engineering. A folding plate of a Caledonian 4-6-0 locomotive is used for general reference purposes, with a few photographic reproductions and a number of diagrams and drawings in the text. Commencing with the boiler, in further chapters the writer deals with the engine; valves and valve gear; framing, springs, axles and wheels; coupling wheels and balancing; compounding and superheating, &c. Copies can be obtained from the offices of the RAILWAY MAGAZINE at the published price.

REPAIRING OF LOCOMOTIVES. By E. L. Ahrons. [Locomotive Publishing Company, Limited. Price 2*s*. 6*d*. net.] Vol. II of this serial publication is now issued. It deals with boiler and firebox repairs and covers the subject-matter very thoroughly, ranging from riveting and caulking, boiler shell and tube plate repairs, patching, staybolt replacement to re-tubing, superheater attention, the brick arch, and testing before returning an engine into service. Parts I and II are kept in stock at the RAILWAY MAGAZINE offices, and can be supplied at the published price.

THE MARYLEBONE MESSENGER. Published from the Station Superintendent's Office at Marylebone, Great Central Railway, price 1d. This leaflet—described as "a medium of inter-communication for the staff of the Great Central Railway in the London area"—is a revival on a small scale of the "Great Central Railway Magazine" discontinued during the war. No. 1 of the "Messenger" consists only of eight pages, good for a beginning, but a great deal of interesting material is well and interestingly presented. Most of the contents are of a staff and topical character, but Mr. A. F. Bound, Signal Superintendent, describes the "Reliostop" system of mechanical brake control, instituted between Marylebone and Wembley Hill since 1916, all the 4-6-2 tank engines being fitted. A useful feature is a table of Institutions, &c., available for the Marylebone staff, with a complete list of trains leaving the terminus.

THE RAILWAY AND LOCOMOTIVE HISTORICAL SOCIETY BULLETIN. Reference was made last month to the formation of this society in the United States, and we have now received a copy of the first Bulletin issued. It is a well-produced brochure, at present for private circulation only. Its contents include an interesting article entitled "Yesterdays on the New York Central," in which Mr. A. Curran details the history of the Empire State Express, and the engines used at various periods, besides reviewing other developments on this line. Mr. Warren Jacobs tells the story of the New York and New England Railroad and its beginning, the Walpole Railroad, chartered in 1846. Mr. C. E. Fisher describes "America's Most Famous Trains." Several photographic views are reproduced. For the benefit of readers who may be interested we may mention again that Mr. A. Curran, 16, Ballard Street, Newton, Mass., U.S.A., is Recording Secretary, and will be pleased to answer inquiries.

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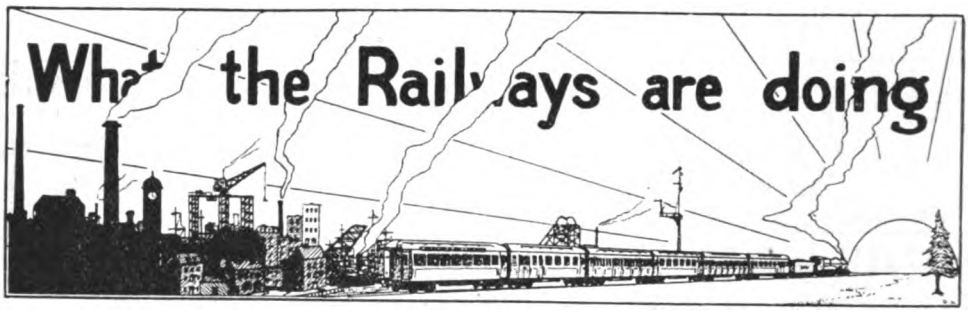

Mr. J. S. Steven, who has been appointed Solicitor, jointly with Mr. D. J. Forgan, of the Caledonian Railway, was born in the Royal Borough of Rutherglen. He received his early education there and afterwards studied at the Glasgow Athenæum and Glasgow University. Mr. Steven joined the legal staff of the Caledonian Railway in 1889, and shared the heavy duties devolving upon the legal department in connection with many important developments such as the Glasgow Central Railway, the Mid-Lanarkshire Lines, the Leith Lines, the Grangemouth Docks, the Glasgow Central Station extension and the Ballachulish Extension Railway. He was appointed Assistant Solicitor in 1908. He is a member of the Glasgow Faculty of Procurators, a keen golfer, and an officer of the Boy's Brigade.

MR. J. S. STEVEN.
Joint Solicitor, Caledonian Railway.

* * *

Mr. H. E. Blain, C.B.E., Assistant Managing Director of the London Underground Group of Companies, has been retained by the Transportation Commission of Toronto to advise that important Canadian city on its transportation problems. After he has completed his report for Toronto, Mr. Blain will be joined by Mr. C. S. Louch and Mr. J. L. B. Lindsay, the Comptroller and Accountant and the Assistant Secretary and Treasurer, respectively, of the Underground Group, and the party will then make a tour of many of the important cities of the United States to study their transportation methods.

At the Installation Meeting of the London Warwickshire Lodge, No. 3846, held at the Café Monico on April 25, W. Bro. John C. Mitchell, F.C.I.S., P.M., 3707 P.Z. 7 (Secretary and Treasurer of the Underground Railways) was installed as reigning Master for the ensuing year. Among those present at the meeting and the subsequent banquet, were the Rt. W. Bro. Col. W. F. Wyley, V.D., D.L., J.P., Prov. G. M., Warwickshire; V.W. Bro. Rev. Canon C. W. Barnard, M.A., P.G.C. Dep. Pro. G. M. Warwickshire; W. Bro. E. P. Debenham, S.G.W. Eng.; W. Bro. Manville, J.G.W. Eng.; W. Bro. H. C. de Lafontaine, P.C.D. Eng.; W. Bro. the Hon. Sir John Cockburn, P.C.D. Eng.; W. Bro. P. Myers, P.G.D.; W. Bro. J. Thornton (Superintendent of the Line, Underground Railways); W. Bro. V. Samuel; Bro. the Rev. B. H. Lynes. W. Bro. John C. Mitchell was born in Birmingham in 1867, and has spent practically all his business life in passenger transport work in London. Commencing in 1886, on the staff of the London Road Car Company, Mr. Mitchell is now Secretary and Treasurer of the Underground Railways and London General Omnibus Company, Limited. He was President of the Chartered Institute of Secretaries for the year 1917, and in addition to being a member of the Lambeth Borough Council, he takes a keen interest in the local affairs of that district.

* * *

It is proposed by the Council of the Institution of Railway Signal Engineers to

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re-introduce the award of a premium of 10 guineas for the best paper read before the Institution in each Session. The present session ends on December 31, 1921. A list containing no fewer than twenty-seven suggested subjects for papers is being circulated by the hon. secretary, Mr. M. G. Tweedie, Great Western Railway Signal Department, Reading.

* * *

At Willow Walk Goods Depôt, London, Brighton and South Coast Railway, Mr. White, the Goods Superintendent, recently distributed badges, bars and diplomas of the London Safety First Council to 33 carmen who during the year 1920 were free from accident. Mr. Geo. H. Dennis, on behalf of the general manager, congratulated the men on their good record, and pointed out that the need of caution was never greater than at the present time. The number of street accidents during 1920 showed an increase on the previous year, and it was only by increasing care and vigilance that accidents could be averted. He regretted to find that one or two competitors had been unsuccessful. He hoped, however, that they would not be discouraged, but would enter for the next competition.

* * *

On Wednesday and Thursday, May 4 and 5, the Dramatic Section of the T.O.T. Philharmonic Society followed their first public performances in January last at the Guildhall School of Music by most satisfactory renderings of the well known Gilbert and Sullivan comic opera, "The Pirates of Penzance," at the King's Hall, Covent Garden. On both evenings the hall was well filled, and high appreciation was evidenced of the time and trouble spent in attaining so high a level of excellence by the 60 members of the Dramatic Section who took part, all recruited from the staff of the various "Underground" railways. Several of the directors and many of the chief officers of the associated companies were present on one or both evenings, of whom the following may be mentioned: The President of the Society, Lord (and Lady) Ashfield, Chairman and Managing Director; Sir Henry Babington Smith, K.C.B., C.S.I., Sir Lewis (and Lady) Coward, K.C., Daniel Duff, Esq., E. Manville, Esq., M.P., H. E. Blain, Esq., C.B.E., Assistant Managing Director; and Messrs. A. L. Barber (Commercial Manager), C. S. Louch (Comptroller and Accountant), J. C. Mitchell (Secretary and Treasurer), J. L. B. Lindsay (Assistant Secretary and Treasurer), A. R. Cooper (Engineer, Railways), G. J. Shave (Engineer and Operating Manager, Omnibuses), J. P. Thomas (Operating Manager, Railways, and Chairman of the T.O.T. Philharmonic Society), S. J. Webb (Passenger Agent), J. Thornton (Superintendent of the Line). The Dramatic Section was formed as a branch of the T.O.T. Philharmonic Society. The performances were produced under the direction of Mr. Emil Hardy, while Mr. Ewart Beech, now well known in connection with the public performances of the parent society, was responsible for the musical direction. Mr. John Priestley gave a splendid rendering of the part of the Pirate King, well seconded by Mr. John Woodington as his lieutenant. Mr. Leonard C. Russell was most successful with the difficult part of Frederic, "the slave of duty." Mr. Cyril Corker, as the Major-General, and Mr. G. F. Nicoll, as the sergeant of police, also contributed much to the success of the performance. Of the ladies, Miss Queenie Thomas, as Mabel, and Miss Hilary Pay, as Ruth, took the chief honours, but Miss Elizabeth Duff, Miss Queenie Mullin and Miss Pat Morrison ably seconded them respectively as Faith, Kate and Isabel. Special mention must, however, be made of the chorus, both ladies and gentlemen, some of the choral items being exceptionally well rendered and appreciatively received. Credit must also be given for the work of the orchestra and of the accompanist, Mr. G. Murlis.

* * *

One of the most interesting items in the speech of Mr. F. J. Ramsden, at the meeting of the shareholders of the Furness Railway, was his reference to the determination of the directors to encourage the running of excursions, the promoting of tourist traffic, and the fostering of the passenger service, and he mentioned that there would be four steamers running on Windermere in the coming season as against three last year. There was a period when this traffic was developed to a very great extent thanks to the energy of Mr. Alfred Aslett, the former Secretary and General Manager, and no matter where one went the facilities offered by the Furness Railway stared one in the face, whether on hoardings or in hotels. Commenting upon this, a local writer remarks:—

"I remember on one occasion, in an out-of-the-way place on the East Coast taking note of a number of people admiring one of those fine groups of photographs of Lakeland which the Furness Railway sent out. The result was that a large party took advantage of the facilities offered and had an enjoyable holiday in the Lakes. And doubtless many were attracted by the same means."

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REFERRING to Mr. Edwin J. Miller's photograph of viaduct at Newport, on Sandown Line, on page 217, April RAILWAY MAGAZINE, an Isle of Wight reader remarks that the bridge showing at the end of the viaduct has been replaced by a new one, so that Mr. Miller's photograph taken in the late autumn of 1920 is already out of date. The new bridge carries telegraph wires over, instead of alongside the track, which is for single line working.

* * *

LORD GLENARTHUR has been elected Chairman and Mr. Charles Ker Deputy-Chairman of the board of directors of the Glasgow and South Western Railway Company.

* * *

THE first re-union dinner of the Railway Operating Division, Royal Engineers, was recently held in London. Lieut.-Col. G. S. Lynde, O.B.E., R.E., presided over the gathering, which was attended by over 80 former members of the corps. Many expressions of regret for non-attendance were received, the curtailed travelling facilities due to the coal stoppage being the principal reason. Proceedings commenced with a reception at the Imperial Hotel, dinner being followed by a concert under the direction of Mr. Alex Spater, one of the former principals of the R.O.D. concert party ("The Rascals") so celebrated in Audruicq and vicinity during the war, the enthusiasm with which the numbers were received being vividly reminiscent of those days. The loyal toasts and of "Fallen comrades" having been honoured, that of "Audruicq" was proposed by Mr. G. J. C. Bunker, who, after having feelingly referred to the delights (?) of that celebrated town, briefly mentioned the circumstances which had led to the inauguration of the Re-union, and took the opportunity to call attention to the prominent part played by Col. Lynde in this matter. In reply, Col. Lynde paid a glowing tribute to the *esprit-de-corps* which had animated all ranks at the locomotive depôt at Audruicq, without which the results obtained would not have been possible. He specially mentioned that many eminent engineers who had visited that depôt were amazed to find that it was possible for work such as was done there to be executed at all under the conditions then obtaining, and still more so, when they observed the degree of efficiency which was maintained. He was pleased to find that same *esprit-de-corps* manifested again so remarkably in the gathering-in at which they were present that evening, especially viewing the fact that the R.O.D. was recruited from the whole of the United Kingdom, and not, as in the case of many other units, from one county or district alone.

* * *

IN January a prize of two guineas was offered for competition for the best essay contributed by a member of the Glasgow and South Western Railway Ambulance Brigade. The subject was "Nature's method of repair in injuries to Bones and Blood Vessels, with special reference to the treatment of fractures." The Arbiter, Dr. George R. Livingston, Dumfries, has awarded the first prize to Mr. George Milligan, Goods Guard, Hurlford, and to him Mr. David Cooper, General Manager, Glasgow and South Western Railway, has forwarded the sum of two guineas. The essays submitted by the following competitors, whose names are shown in order of merit, have been highly commended:—Arch. M'Creath, Clerk, Harbour Office, Ayr; Robert Blane, Engine Driver, Ayr; William Kirk, Clerk, Goods Manager's Office; George Black, Shunter, Ardrossan Harbour; John Holland, Engine Driver, Ardrossan.

* * *

THE annual competition for the Cambrian Railways Ambulance Shield, has taken place at Aberystwyth. The number of teams competing for 1921 constituted a record for the Cambrian Centre, and is the result of the constant encouragement given to the movement by the directors and the general manager. The result was:—

Team.	Marks obtained.
Afon Wen	196
Oswestry Traffic ..	185
Machynlleth	162
Oswestry Works No. 1	158½
Llanidloes	139
Portmadoc	130½
Aberystwyth	127½
Welshpool No. 1 ..	125
Welshpool No. 2 ..	116½
Oswestry, Engineer's Department	105½
Builth Wells	103½
Oswestry Works No. 2	85

The judges were Dr. Meredith Young, Chester, and Dr. Donaldson Tullis, Hereford. The various teams were highly complimented by the judges on the excellent manner in which they had carried out the tests, a fact which helped considerably, as it gave encouragement to the company, and in return justified the company in doing more to encourage the Ambulance movement. Major David Davies, M.P., Chairman of the Cambrian Railways, has again kindly promised to give prizes to the first three teams. All

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the arrangements for the competition were made by Mr. T. C. A. Hodson, the Centre Secretary. The competitors were entertained to lunch and tea at the Queen's Hotel, Aberystwyth, and it was arranged that the challenge shield and the prize would be presented by the General Manager, Mr. S. Williamson, at a later date. The winning team (Afon Wen), represented the Cambrian Railways in the Inter-Railway Competition at London in April, and gained the eighth place out of 25 teams then competing, thus qualifying for the final competition on May 20. This is the first occasion on which the Cambrian Railways have been represented in the final competition.

* * *

THE Great Western Railway's Chief of Police has instituted at headquarters a series of lectures, or informal talks, on police and detective work, which give promise of excellent results to the mutual advantage of the company and the staff of the Police Department. The primary object is to enable the rank and file to take a wider view of the duties allotted to them, and to explain, *inter alia*, how their own particular task is linked up with the general scheme for the prevention and detection of crime on the railways. In the lectures that have already been given by the Chief of Police, the lecturer has insisted on the importance of preventive measures in restricting pilfering, and the necessity for a high standard of efficiency in the police force as a means for attaining this object. It is not in the public interest to describe the lectures in detail, as, although the subject matter would afford satisfaction to the trader and the traveller, it would be revealing valuable secrets to the lawless and enable them to escape from justice. The experiment has been well received by the police staff and it is intended to give opportunities to the staff in the provinces to attend lectures of a similar character.

* * *

THE Lancashire and Yorkshire and North-Eastern Railway Joint Steamship Service between Hull (North Eastern Railway Riverside Quay) and Zeebrugge by the twin-screw steamer *Duke of Clarence*, will be resumed for the season of 1921, the sailings being as under: June 25 to September 24, Hull (North Eastern Railway Riverside Quay) to Zeebrugge Quay at 6 p.m., Wednesdays and Saturdays. June 27 to September 26, Zeebrugge Quay to Hull (North Eastern Railway Riverside Quay) at 6.30 p.m., Mondays and Fridays (except Monday, July 25, when the sailings will be Sunday, July 24). Boat trains to and from Hull (North Eastern Railway Riverside Quay) and between Zeebrugge Quay, Bruges, Ghent and Brussels, will be run with connections at the latter place for all parts of Belgium, Northern France, and Central Europe.

* * *

A PROPOSAL has been put forward to construct a standard-gauge line between Totton and Fawley, via Hythe, and application has been made to the Light Railway Commissioners for powers to incorporate a company to be called the Totton, Hythe and Fawley Light Railway Company, and to make construction and working agreements with the London and South Western Railway. The proposed line would connect up with the London and South Western Railway, Southampton West to Bournemouth main line, at a point a short distance westwards from Totton Station. Its length will be 9 miles 1 chain, and will run parallel with Southampton Water. The total capital cost of the scheme is estimated to be £252,327. It will be remembered that the London and South Western Railway obtained powers in 1903 for the construction of a line between the two points mentioned, but it never materialised.

* * *

EBURY ROAD Bridge, crossing the London, Brighton and South Coast Railway main lines at Victoria, has been raised in order that the conductors for electric current supply may be continued under the bridge. Previously, owing to the close headway and the great depression of the collector bows in passing under the bridge, an insulated bar was used in place of the conductor wire, but the alteration noted will enable electric trains to obtain current without intermission as they face the commencement of the gradient of 1 in 64 which here begins. Some of the London, Brighton and South Coast Railway suburban sets of coaches for steam trains are now made up as follows: 6-wheeled third brake, 6-wheeled third, 6-wheeled composite, bogie third, bogie first, bogie composite, bogie third, 6-wheeled first, 6-wheeled third, and 6-wheeled third brake.

* * *

CONCERNING London and North Western Railway locomotives, Mr. C. Williams writes from Crewe as follows:—

Nos. 149, 150 and 152 are the first three of a new series of "Claughton" class locomotives, recently put in hand at Crewe. The 0-6-2 coal tank engines previously numbered as above are now Nos. 3721, 3722 and 3723, respectively. Nos. 1920 *Flying Fox*, and 1972 *Hindostan*, four-cylinder compounds, have been converted to two-cylinder simple "Renown" class. It is reported that two

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others now being converted are to have superheaters. The following four-cylinder compound mineral engines have been simplified and superheated :—0-8-0 : Nos. 916, 1041, 1224, and 1279 ; 2-8-0 : Nos. 1236 and 1586. In the case of the two latter, the leading pair of wheels are now dispensed with. No. 2490 is the latest 0-6-2 tank to be fitted up for motor work. The 6 ft. 6 in. "Jumbos" Nos. 1216 *Premier* and 1220 *Belted Will*, also the old single-wheeler *Engineer*, *South Wales*, have been broken up.

* * *

ONE of the older double-framed 0–6–0 goods engines on the Great Western Railway, No. 369, has the unusual distinction—for this line—of a red background to the number plate.

* * *

MR. L. B. HEWITT, Bath, writes :—With reference to your reply to A. R. Hamson, on page 332, of the May RAILWAY MAGAZINE, *re* Great Western locomotive No. 4123, your correspondent may be interested to know that this engine is still running with the name removed. I saw her in this condition as recently as April 27. Presumably the title, first bestowed in 1900, when the engine was put into service as one of the "Atbara" type, and numbered 3376, is now considered to savour too much of the unspeakable Hun. No. 4123 is now identical with the "Flower" class, as her number indicates.

* * *

THE foregoing correspondent also communicates :—"Your reply to H. T. Hobbs, *re* the Great Western locomotive, No. 3555, may be taken as correct with the minor exception that, strictly speaking, the "Stella" class are 2-4-0 locomotives. I believe they were originally converted from side tank locomotives and, as re-built, were designed for use on the South Devon section of the line. The number of *Stella* was 3201. One of this class, after re-building was illustrated on page 165 of the RAILWAY MAGAZINE, Vol. IV. One of the type, No. 3511, in its original condition as a 2-4-0 tank engine was illustrated in Vol. VI of the RAILWAY MAGAZINE, page 184. During the war period, the re-built engines of the 3555 class to which your correspondent refers often worked over the London and South Western Railway between Salisbury and Portsmouth. This class was re-built in the late "nineties."

* * *

A BATH reader writes :—"Assuming that steam traction continues to occupy pride of place on the Great Western Railway in, say, ten years' time, it will be an extremely difficult achievement to point to a locomotive on that line which possesses a number of less than four figures. Practically all the locomotives constructed at Swindon, or acquired in the last 15 years, bear four-figured numbers. The only exceptions that I can recall in this period are *The Great Bear*, No. 111, and the three French compounds, Nos. 102 to 104. Engines bearing numbers of three figures are frequently met with to-day, but only in the older standard classes, the 0-6-0 goods (both tender engines and tanks) and the smaller six-wheeled side-tank engines. Every one of the standard classes introduced by Mr. G. J. Churchward is distinguished by a four-figured number, and even to day I am convinced that a study of Great Western locomotive working at any main line station or depôt, would indicate that the majority of the locomotives in service have four-figured numbers."

* * *

A SOUVENIR list of the existing named locomotives of the London, Brighton and South Coast Railway has been compiled by Mr. Alfred Keeping, "Pope's Folly," Brighton, and is published by him at 7d. per copy, or three copies for 1s. 2d. The souvenir takes the form of an octavo leaflet, with the numbers and names of 18 locomotives, together with the compiler's name and address, printed in gold letters.

* * *

AT the Railway Club, 65, Belgrave Road, S.W.1., on May 13, the members were favoured by a paper by Mr. Cecil J. Allen, who took for his subject "Some considerations affecting passenger train time-keeping." Mr. Allen dealt with his theme in his usual masterly manner, dividing the causes that contribute to divergencies from scheduled train times under these heads, locomotive, engineering and traffic. Under the latter heading, he dealt particularly with signal checks. Mr. Allen, as usual, was constructive in his comments rather than critical, and among other suggestions he took into consideration the advisability of instituting a system of passenger train control. Further he advocated that in all cases the timings in the public and in the staff time-tables should be the same, and supported his theory with logical reasoning. At the conclusion of his paper Mr. Allen was heartily thanked and congratulated, and an interesting debate ensued. Mr. Bazley, Hon. Secretary of the Club, announced that an attractive series of lectures is being arranged for the autumn and a number of visits to locomotive sheds and works will take place in the interim. Mr. H. L. Hopwood, a frequent contributor to the RAILWAY MAGAZINE, has been elected assistant Hon. Secretary to the Railway Club.

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REVERTING to former practice, the "Underground" Electric Railways are issuing handy pocket maps of the system for the use of travellers, especially visitors to London. These maps may be obtained by RAILWAY MAGAZINE readers on application to the Traffic Advertising Agent at Electric Railway House, Broadway, Westminster, S.W.1.

* * *

THE Great Northern Railway 1921 edition of the "Holiday Manual," contains particulars of the hotels, boarding houses, and furnished apartments at the seaside and inland resorts served by the Great Northern system, together with much information of use to the intending holiday maker. Copies may be had gratis, at any Great Northern station or Town Office, or will be sent by post on receipt of 3d. stamp by Superintendent of the Line, Advertising Department, 26, Pancras Road, King's Cross, N.W. 1.

* * *

RAILWAY statistics issued by the Ministry of Transport for the month of February, 1921, reveal a falling off in all classes of traffic. On the freight side there is a decrease of over 5,000,000 tons carried, or 19 per cent., as compared with the corresponding period of 1920. The average receipts per ton-mile (excluding cost of collection and delivery) were :—

	d.
General merchandise	2·965
Coal, coke and patent fuel ..	1·345
Other minerals	1·826
	1·973

The average train load was 126·02 tons compared with 133·14 tons in the corresponding period of 1920, due partly to a slight decrease in the average wagon load. As regards rolling-stock, 44 locomotives, 40 carriages and 3,567 wagons were completed and put into traffic during the month. The numbers under and awaiting repair remain practically unchanged.

* * *

IN the House of Commons, the Minister of Transport, referring to the coal miners' strike, in answer to Mr. W. Thorne, said: I am not yet in a position to state the amount of revenue lost to railway companies through the present coal stoppage, and no reliable estimate can be framed of the amount involved until the companies' claims for the month of April are received. The loss will, however, fall to be borne by the Government under the railway agreements with regard to the guarantee of net receipts. The coal strike in October last resulted in a loss of £8,000,000 in respect of railway working, and this sum was made good by the Government. It will be understood by the House that although the receipts fall abruptly, the Government is called upon to pay a great deal of expenditure such as maintenance at the high standard of 1913 irrespective of revenue.

* * *

FOLLOWING on the introduction of Sir Eric Geddes' Railways Bill, which will determine the future of the whole of our railway system, the Central Council of English, Scottish and Irish Railway Stockholders' Protection Associations, representing some 60,000 shareholders and 220,000 separate holdings, has arranged to hold public meetings throughout the country. The Council has also issued a booklet classifying "a few of the sixty thousand members," indicating the representative nature of the Association, and the widespread support given to their work. Further particulars can be had from the Secretary, 25, Victoria Street, Westminster, S.W. 1.

* * *

A SCHEME for the improvement of transport facilities between the north and south of England is to be placed before the Ministry of Transport, It is proposed to cut a new tunnel under the Thames between Gravesend (Kent) and Tilbury (Essex), and from Pitsea (Essex), which is already joined by railway to Tilbury, to construct a new railway across Essex, Hertfordshire and Bedfordshire, touching the Great Eastern main lines at Ingatestone and Sawbridgeworth, the Great Northern at Stevenage or Hitchin, London and North Western at Luton, and Midland at Bedford. There would then be direct communication between Dover and the south-east of England and the Midlands and the north for passengers and the huge volume of traffic which at present goes through London. It has been estimated that the tunnel would take two years to build and would cost about £2,500,000.

* * *

THAT the National Union of Railwaymen was saved from disaster by the responsible officials refusing to call a strike in support of the coal miners is realised by all unprejudiced observers. On this subject a striking and illuminating article entitled "Face the Facts" has appeared in the Society's organ, the *Railway Review*. In it the writer admits that the rank and file were unwilling to come out. He says: "The chief element ensuring success was lacking—there was an astounding lack of appreciation *in the rank and file* of the fundamental principles at stake. . . . As an instance of the apathy, reluctance and resentment so prevalent let me whisper the damning truth that upon a 240-mile stretch

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of southern main line railway not more than 50 men expressed any desire to strike for the miners' cause. At one National Union of Railwaymen branch not 5 miles from the Somerset coalfields, in a Parliamentary area boasting a splendid miner candidate, the proposition to 'obey the call' did not find a seconder!"

* * *

In Queensland, where most of the railways are administered by the State, there is one mile of line for every 130 inhabitants. With the exception of Western Australia, Queensland has the smallest population per mile of railway in the world, the figures in that respect ranging from 94 in Western Australia to 3,360 in Russia. The corresponding figure for Great Britain is 1,943. In Queensland the average number of passengers per mile of line is 5,000, and the average tonnage 673. Probably in no other country in the world is the volume of business in comparison with the mileage so low as in that State. Reporting upon the peculiar conditions the Queensland Commissioner for Railways, Mr. J. W. Davidson, says:—"It is recognized that economy in operation can be effected by the haulage of larger engine loads on our main trunk lines, and I have been going closely into the matter with this end in view. The demand all the world over is for better lines and heavier engines, and we are in that position here so far as the trunk lines are concerned. At present our heaviest engine weighs 90 tons, and has a tractive force of 21,735 lb. This is somewhat lower than engines in use in New Zealand, where the heaviest engine weighs 94 tons and has a tractive force of 26,620 lb., whilst it is only half the weight of the heaviest engine in South Africa, which has the same 3 ft. 6 in. gauge. A more powerful engine than our "C 18" cannot be adopted here because our bridges are already carrying the limit of their load, and if heavier engines are to be used, it will be necessary to spend large sums of money in strengthening bridges to carry them, and in laying portions of the line with heavier rails. In the meantime more engines within our existing limitation must be obtained to carry on."

* * *

In the House of Commons recently the Minister of Transport was asked whether he was aware that passengers travelling on the Midland (London, Tilbury and Southend) Railway to Laindon and desiring to continue their journey to Pitsea, were being charged an excess fare of 9d.; that the legal pre-war rate was 2d.; whether this new charge was in conformity with the decisions of the Rates Advisory Committee; and, if not, would he take steps to rectify this matter? In reply, Mr. Neal said: It appears that under the London, Tilbury and Southend Railway Act, 1882, section 32, the company are empowered to charge fares to Pitsea and beyond based on the mileage distance calculated via Tilbury, and on a throughout journey from London the difference between the fare to Laindon and Pitsea is 9d., although the local fare between the two stations is only 3½d. I am having further inquiries made and will afterwards communicate with the hon. member.

* * *

Colonel Sir C. Yate, on May 2, asked the Minister of Agriculture whether he would now suggest to the railway companies the advantage of utilising spare ground along their lines for the planting of apple trees with a view to the promotion of the growth of apples in this country. Sir A. Boscawen replied: I am advised that the soil of which railway embankments are composed is rarely suitable for the growth of fruit trees. If apple trees were planted on them and they did not receive continual attention in the way of cultivation, pruning spraying, &c., they would produce little but inferior fruit, and that only in years of generally abundant crop. The Ministry, therefore, is not prepared to advise railway companies to embark on the business of fruit growing on railway embankments.

* * *

From Grange-over-Sands Mr. George Taylor writes:—

"I notice in the May number of the Railway Magazine that you state that four 4-6-4 tank locomotives have been placed in service on the Furness Railway. *Five* of these engines are now running numbered 115-119, and taking the numbers of five old 0-6-0 goods locomotives. It may interest some of your readers to know that one of the new engines regularly works the 9·15 a.m. express Barrow to Carnforth, the train consisting of through coaches for Euston and the London & North Western line—the same locomotive returning from Carnforth on the 12·15 to Barrow with through coaches *from* Euston. On most days this train is very heavy.

"Several Furness trains now run through to Lancaster (Castle Station), the locomotives returning with through coaches detached at Lancaster instead of Carnforth. The new nine-compartment third-class coaches are now running, and compare with any in the kingdom, although they give trains an odd look owing to the greater width and higher roofs than the ordinary coaches."

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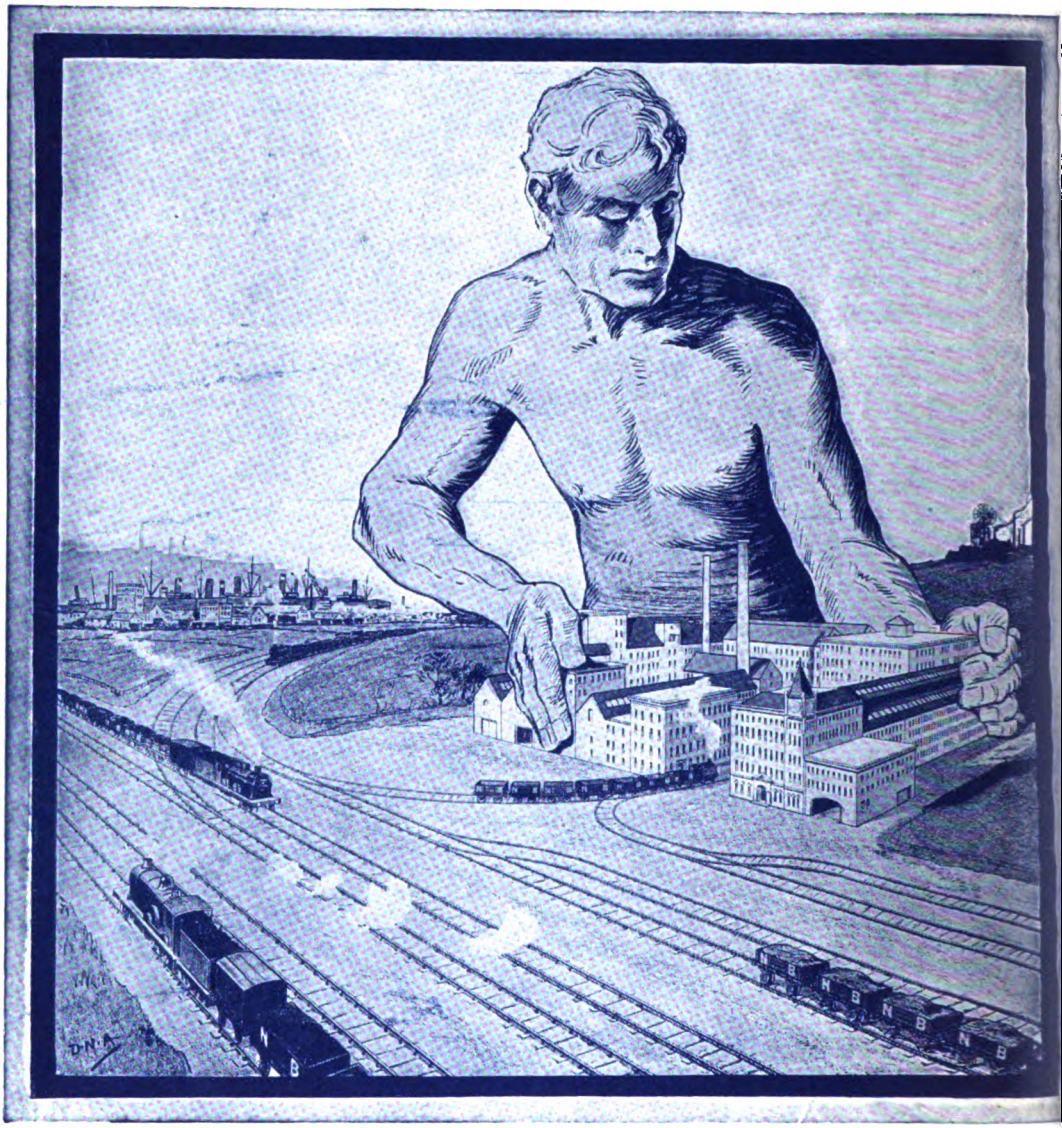

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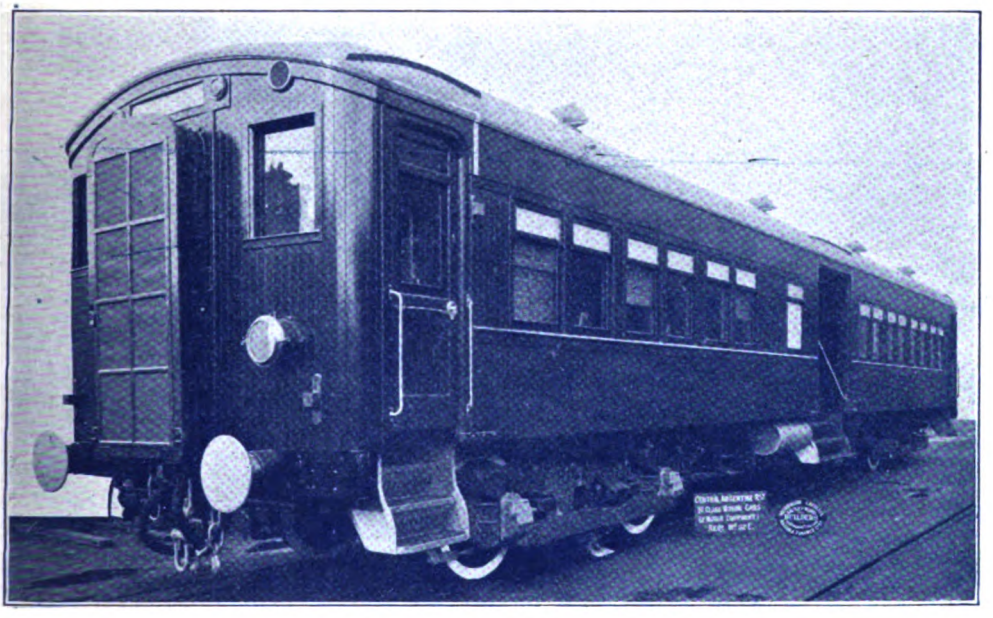

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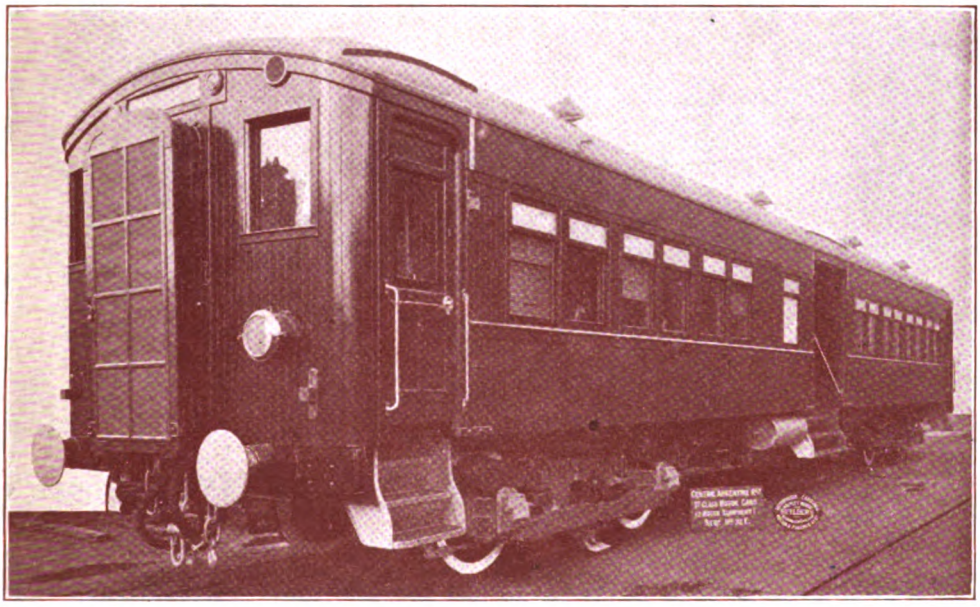

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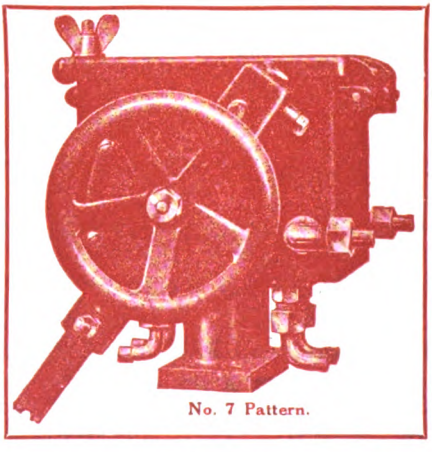

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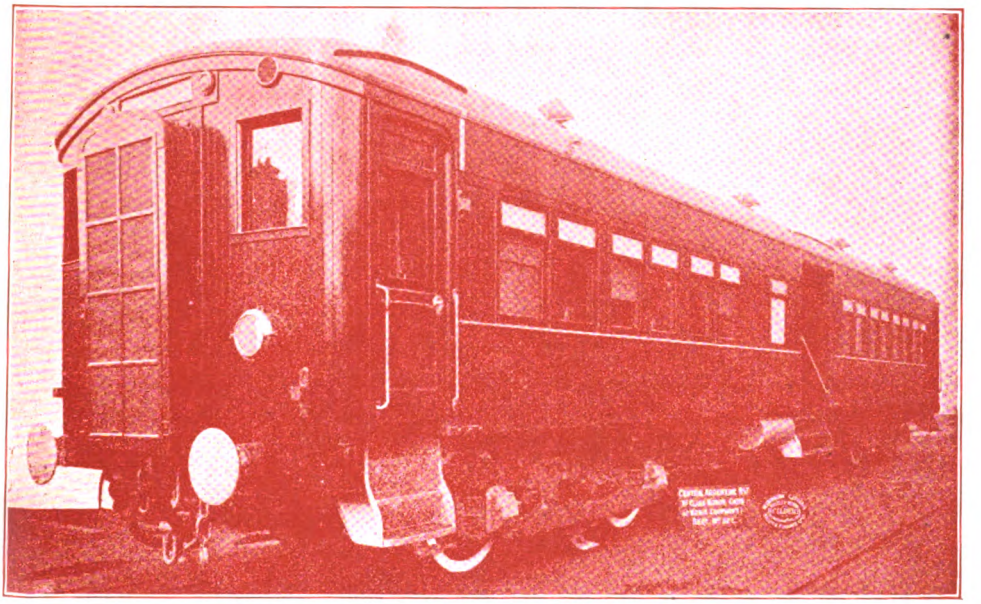

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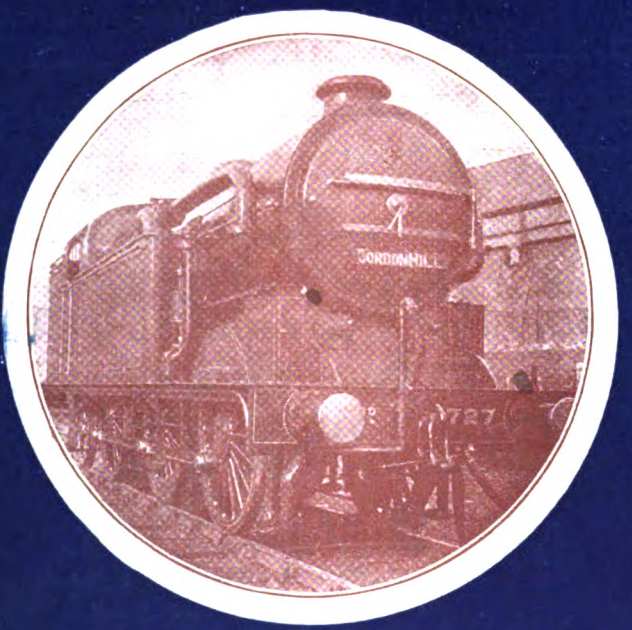

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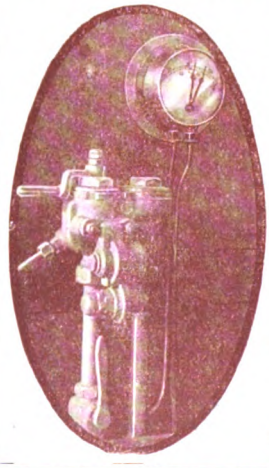

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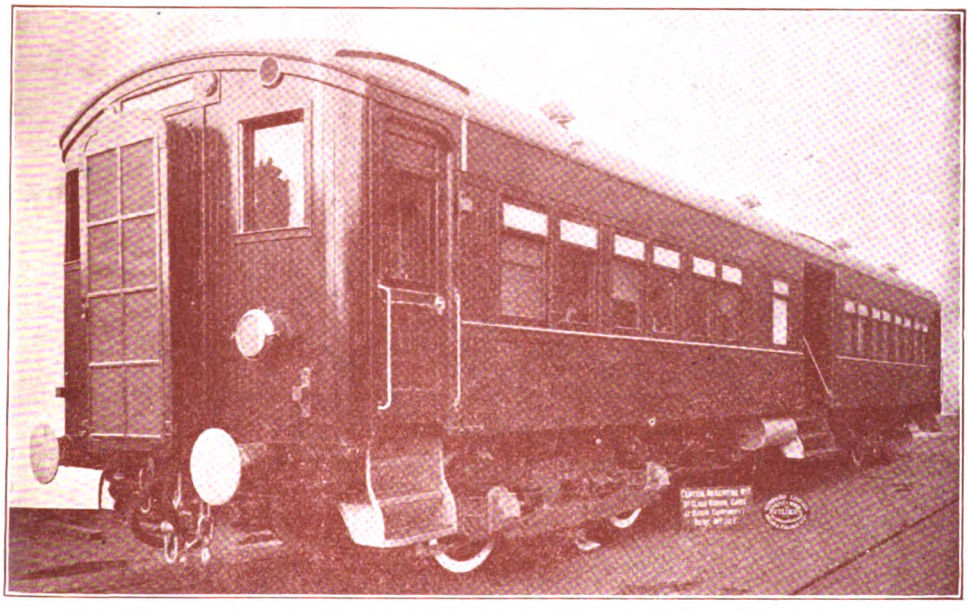

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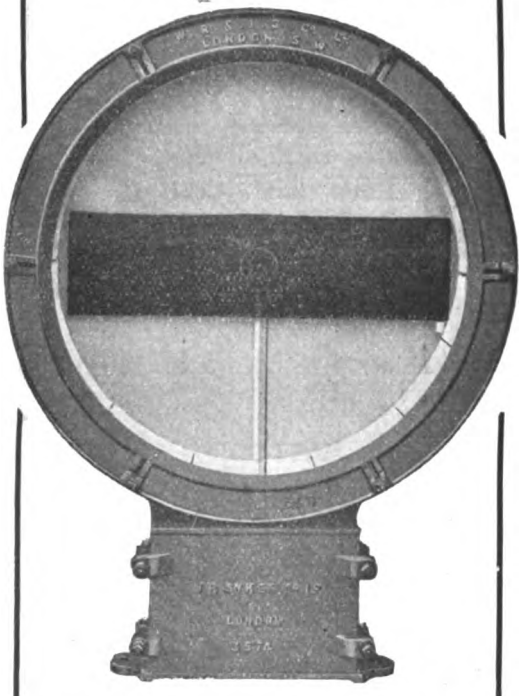

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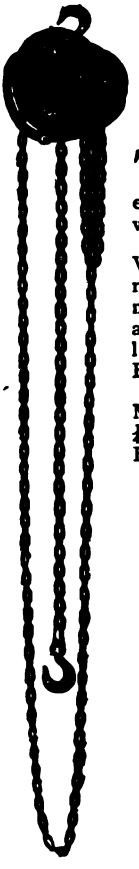

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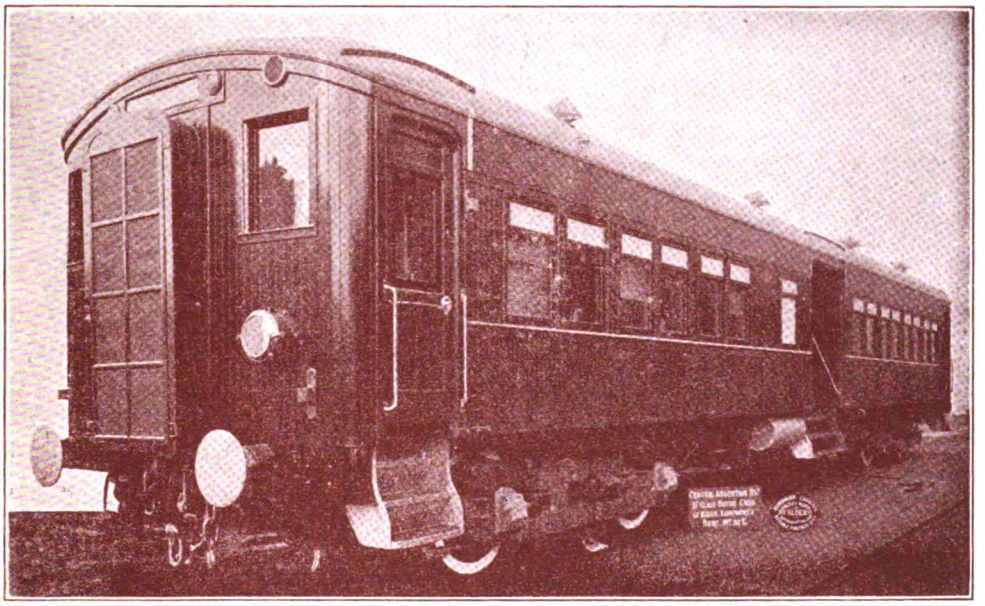

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